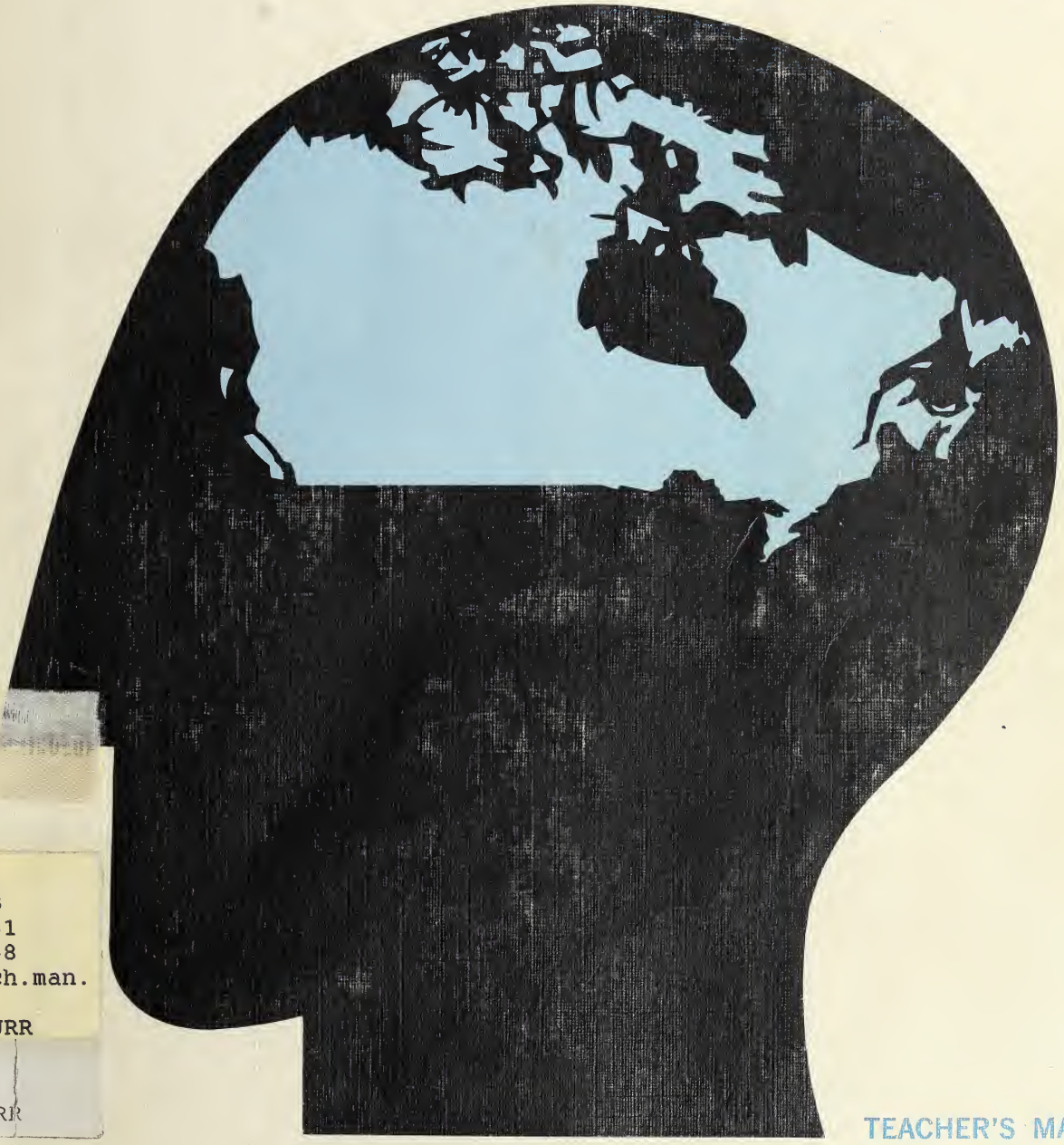
A guide to Understanding CANADA



TEACHER'S MANUAL

Teacher's Manual

for

A Guide to Understanding Canada

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A Guide To Understanding Canada is organized in a way that permits your students to progress from a simple to a more complex understanding of Canada's historical, economic, social, and political development. Questions are coordinated with the visual material in order to help the students develop skills in reading maps, charts, and graphs, and gathering information from photographs and diagrams. Chapter 9, "Working With Maps," can serve as a review of the skills your students have learned, but you might prefer to use it as a general introduction to your study of Canada's geography. Or, you might arouse your students' interest by beginning with the chapter that deals with the region where they live.

The questions in the textbook are of varying levels of complexity; they require different degrees of preparation and skills. Although most of the questions can be answered by referring to the visual material provided, some problems require additional information from other sources. In such cases, your own knowledge of your students' individual interests and abilities will help you decide what approach to use – whether to have each student pursue separate topics in a form of independent study, whether to assign these problems to smaller groups within the class as research projects, or whether to tackle the problems in discussions involving the entire class.

In many cases, by using the questions in the **Guide** as your point of departure, you can develop related issues for discussion, or other projects suitable to your particular classroom situation. For example, subjects such as the relationship of national and international politics to geography might be more fully explored, and, interesting studies can be made of the similarities between regions in Canada and the United States – the Canadian Prairies and the plains of the United States, the Atlantic Provinces and New England, the Cordillera and the Northwest region of the United States.

Your students may offer suggestions of their own regarding research projects, and they may offer alternative answers to problems that are raised. You can reinforce their interest by remaining flexible, while at the same time guiding them within the framework of **A Guide To Understanding Canada.**

Page 2: LOCATION, SHAPE, AND SIZE

A. 1. Canada's land areas extend to latitude 42° N. in the South at Pelee Island in Lake Erie, and latitude 82° 31′ N. in the North at the northern tip of Ellesmere Island, Cape Columbia, in the Arctic Ocean. The distance between these two points is 2,900 miles. (Note: All distances are approximate.)

B. 1. From east to west along the 49th parallel is 3,320 miles, one-fifth of the distance around the world.
2. It would take about 66 hours and 24 minutes to drive this distance at 50 miles an hour, and about 8 hours and 18 minutes to fly this distance at 400 miles an hour.
3. Canada's land areas extend to longitude 141° W. at the Yukon-Alaska border in the West, and to longitude 52° W. at St. John's in the East, a distance of 3,200 miles. The distance between St. John's and London, England is 2,300 miles; thus, the distance across Canada from east to west is 900 miles greater, or about 28 percent greater than the distance from the eastern tip of Canada to London.
4. The distance between Montreal and Calais, France is 3,400 miles; between Halifax and Liverpool, England, it is 2,700 miles; between Vancouver and Sydney, Australia, it is 7,500 miles; between Vancouver and Tokyo, Japan, it is 4,400 miles.
5. The shortest route from Edmonton to Moscow runs north-northeast over a distance of 4,800 miles.
6. Going eastward, the distance between Edmonton and Moscow is 5,500 miles, and going westward it is 7,760 miles.
7. The shortest distance between Dawson and Oslo, Norway is 3,600 miles following a Great Circle Route.
8. A Great Circle Route is the shortest line between two points of the earth's surface following the natural curvature of the earth. If this line is continued, it returns to its point of origin, thus dividing the earth into two equal parts.
9. While all major seaports of Europe and North Africa are within a 3,500 mile radius of Halifax, the closest major Asian seaport, Yokohama, Japan, is 5,000 miles from Vancouver. By using Great Circle Routes, all the major cities of Europe and of the Soviet Union are within easy reach by air, while other points in Asia are considerably farther away. Thus distance, in conjunction with other factors, has insured that Canada's closest ties are with Europe, especially Western Europe.

C. 1. Canada interposes a huge land mass between the United States (except for Alaska) and the Soviet Union.
2. Canada is closest to Russia at its western boundary, which is 775 miles from Dezhneva (East Cape) in Russia.
3. See Map 4.

Page 4: GLACIATION

Although the process of glaciation is not fully understood, and a number of theories on the origin of major glaciations are yet being examined, it is clear that wherever annual snowfall exceeded annual melting, a portion of the snow remained on the ground at the end of the yearly cycle. This residue grew each year, resulting in an accumulation of hundreds and even thousands of feet. The effects of compression, internal melting and refreezing transformed the snow into solid ice. When thick enough, this mass began to flow outward or downward, pulled by its own weight. The movement of this mass rarely exceeded a fraction of an inch a day, though greater rates are known. This movement resulted in major topographical alterations. Glaciers developed in arctic areas where snowfall exceeds melting, and in mountains of medium and low altitudes where snowfall is heavy and melting periods short, or where snowfall is light but regular, and melting periods virtually nonexistent.

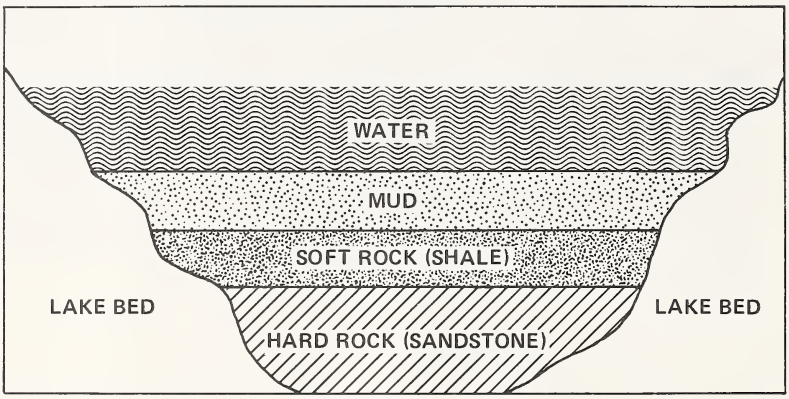
1. The three centres of glaciation were the Greenland Centre, the Labrador Centre and the Keewatin Centre. (See Figure 2.)
2. At their maximum, ice sheets extended south into the United States from New York City westward across southern New York State to northeastern Ohio, and from there along the present Ohio and Missouri river systems to the Rocky Mountains.
3. Several factors account for the irregular southern limits of the ice sheet: obstructions created by the Pacific and Rocky Mountains in the West, the Appalachian Mountains in the East, and the warming effect of the oceans combined with the lack of significant barriers in the middle of the continent.
4. A small area of Canada along the northern Yukon-Alaska border was not covered by glaciers. This is an area of low snowfall. Hence, there may not have been sufficient snow to allow for extensive glacial formation.
5. Some examples of the effects of glaciation are:
   eskers: winding ridges composed of sand and gravel, believed to have been formed by streams that were under or in glacial ice.

moraines: a deposit of gravel, sand, and clay left on the ground by a glacier.
drumlins: a long, narrow or oval, smoothly rounded hill of unstratified glacial drift.
spillways: passageways through which surplus water escapes from a reservoir or a lake.
glacial lakes: lakes carved out by glaciers; many of these are now dry.
scraped rocks: rocks eroded by glacial movement.

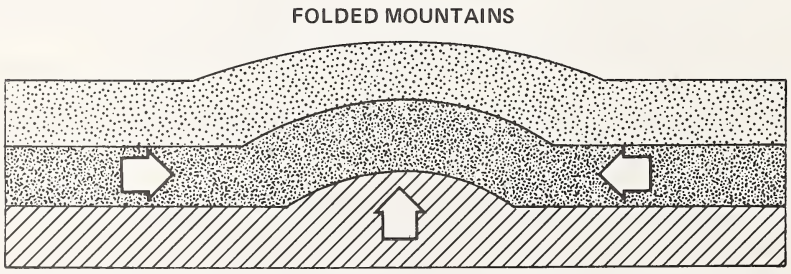
6. In Canada today, glaciers can be seen in the mountains of British Columbia and the Yukon.

Page 5: BUILD

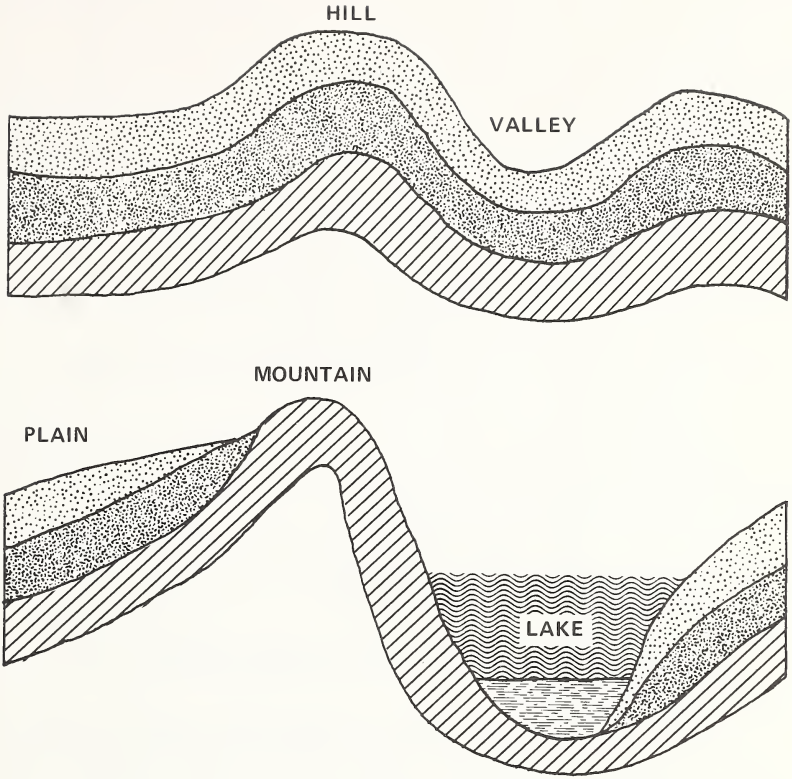
1. The Canadian Shield occupies about 1,850,000 square miles, or approximately one-third to one-half of the whole country.
2. The Canadian Shield is primarily composed of schist formed in the Precambrian Age.
3. The rock in the Shield is the oldest in Canada, and among the oldest in the world. It is estimated to be more than 500 million years old.
4.



a. Sedimentary layers consist of deposits of mud, clay, sand or other debris which have accumulated at the bottoms of lakes, seas and sometimes on the land. These deposits have been converted into hard sandstone by the weight of the shale (clay), mud, and water above it. As the process continues, the upper layers will also be formed into hard rock. Each layer represents a different period of geological time.



b. The process continues, and further pressure folds the land surface into high hills and deep valleys. While the folding process has been going on, weathering and erosion have been wearing away some of the softer parts of the surface. Note that a new layer of sediment has settled on the bottom of the lake.



c. The land has risen, or the water has receded, and pressure from below, and/or from the sides, has caused part of the land surface to rise.

Page 5: DRAINAGE BASINS

A. 1. a. The St. Lawrence River drains into the Atlantic Ocean.
b. The Saskatchewan-Nelson River drains into Hudson Bay.
c. The Mackenzie River drains into the Arctic Ocean.
d. The Fraser River drains into the Pacific Ocean.

2. a. The St. Lawrence river system is 1,900 miles long.
b. The Saskatchewan-Nelson river system is 1,205 miles long.
c. The Mackenzie river system is 2,630 miles long.
d. The Fraser river system is 850 miles long.

B. 1. Fresh water is used for human consumption, irrigation, electric power, industry and recreation.
2. Both the Saskatchewan-Nelson River and the Mackenzie River are fed by glaciers.
3. Major sources of water for rivers include lakes, springs, run-off (rain that flows off from the land in streams), and precipitation.

Page 6: LAND USE

A. 1. Areas of intensive farming include the Okanagan Valley, the Delhi area of southern Ontario, Prince Edward Island, the Annapolis Valley and the Niagara Peninsula.
2. The main types of farming in the Prairie Provinces are grain growing and cattle raising.
3. Because dairy products are perishable, dairy farms are usually located in close proximity to populated areas.

4. Specialized farming is found in the Maritimes in Prince Edward Island (potatoes), the Annapolis Valley (fruit), and the Tantramar Marshes (hay).
5. Soils suitable for agriculture include deciduous forest soils, grassland soils and mixed forest soils, because of their high humus content and ability to retain moisture.

B. 1. Podzol is a whitish-grey soil usually found in moist, subpolar climates. (In Canada, this soil is found mainly in the Shield region.) This soil is not fertile but it is well suited for hay and forest growth. Chernozem (black soil) is found in dryer regions (in Canada in the Prairie Provinces). Because it is rich in humus, it is well suited for crop growing.
2. Other factors affecting agriculture are the length of the growing season and the annual precipitation.
3. i. Fruit and vegetables are grown in the Niagara Peninsula. It has rich soil, and both the Niagara Escarpment and Lake Ontario provide protection against spring frosts.
ii. Fruit is grown in the Annapolis Valley. It has rich soil, and is protected by hills.
iii. Fruit is grown in the Okanagan Valley. Land here is fertile and accessible to irrigation; it is protected by hills, and the area has a long growing season.
iv. Tobacco is grown in the Montreal area where the soil is rich and sandy.
v. Tobacco is grown in the Delhi area in Ontario. The soil here is light and sandy; the frost-free period lasts 140-160 days, and the area receives approximately 14 inches of rain during the growing season.
vi. Vegetables are grown in the Fraser River delta. The area has a long, warm growing season, fertile soil, and abundant rainfall.
vii. Potatoes, hay and oats are grown in the Lake St. John area, where soil is rich and the surrounding hills offer protection from frosts and winds.

C. 1. Pulpwood (used to make paper) is the main product of the forest industry.
2. Controlled or selective cutting allows the forest to reseed itself and to grow to full maturity. Thus, the conservation of this natural resource is insured.
3. Fire is the major threat to the forest industry.
4. Some of the steps that can be taken to prevent forest fires include: informing the public of safety measures and laws regarding campfires and smoking, installing observation towers, and having access to modern fire-fighting methods and equipment.

D. 1. Since these trees are small, they would probably be used for pulpwood. However, their height and straightness might permit their use as poles, railway ties, or fenceposts. Logging operations in the Cordillera are more difficult and expensive than those in more level country because of such problems as access to the forests, difficulty in moving heavy equipment to these areas, providing accommodations for the workers, and moving the logs to mills.
2. The timberline is the point where the forest ends and grass, moss or rock begins. The lack of vegetation above the timberline is due to a combination of factors which include altitude and wind exposure.

E. 1. This photograph was probably taken during the summer because there is a lack of snow and ice cover.
2. During this season of 24-hour light, the Tundra presents a landscape of mosses, lichens, sedges, stony soil, and flooded areas along the streams and shallow basins. Although this region is marked by long, severe winters, the southward-facing slopes remain drier, and flowers bloom there.
3. The Tundra is found in flat, poorly drained areas where the summers are very hot and the winters severe.
4. Except for some trapping and fishing, which cannot be expanded, and the possible discovery of valuable mineral resources, the economic future of this area is poor.

Notes on Photographs

Mixed Forest in the Shield: The trees in this photograph are too small to have commercial value.

Commercial Forest in the Shield: The size of these logs indicates that they will probably be cut for pulpwood.

Commercial Forest in the Cordillera: This forest is probably located in the Canadian Rockies.

Tundra: There is little vegetation in this area because the soil is poor (permafrost—perennially frozen subsoil—is found here), the growing season is short, and the rainfall is slight.

Page 10: PRECIPITATION

A. 1. The Westerlies bring moisture-filled air from the ocean to the coast. In order to cross the mountains, this air must rise; it then cools and contracts, releasing moisture which falls on the western slopes. This precipitation is partially absorbed by vegetation, soil and air; the remainder finds its way into rivers, lakes and the ocean. When this moisture evaporates, the cycle—evaporation, condensation, precipitation—starts again.
2. The vegetation is less luxuriant on the leeward side of the mountains because there is less rainfall; most of the moisture falls on the windward side of the mountains as the air rises; as it descends on the leeward side, the air becomes warmer and tends to absorb moisture.

3. "Rain shadow" refers to areas that are sheltered from the rain-bearing air masses by high hills or mountains and therefore receive little precipitation.

B. 1. The three air masses which affect Canada are: the Arctic air mass from the North, which is dry and cold; the Pacific air mass from the West, which is wet and moderate in temperature; and the Tropical air mass from the South, which is moist and warm.
2. The southerly winds veer eastward along the St. Lawrence River valley because of the earth's rotation, the funnelling effect of the Appalachians and Laurentians, and contact with the Pacific and Arctic air masses.
3. The high mountain ranges of British Columbia force the Pacific air masses to rise so high that they deposit most of their moisture in British Columbia, with little left over for Alberta and Saskatchewan.
4. The winds from the Arctic force the winds coming from the South to rise, cool and condense, which results in precipitation over the eastern part of Canada.
5. The Arctic air masses flowing over northern Canada are cold (they move over an area that is largely frozen) and absorb little moisture, resulting in low precipitation in this area.

C. 1. The total annual precipitation in Edmonton is 14 inches.
2. The greatest precipitation in this area falls during summer.
3. Local records must be consulted to answer this question.

Page 12: TEMPERATURE AND CLIMATE

A. 1. Latitude is the principal factor.

B. 1. Inuvik is near a large body of water, the Mackenzie River, which moderates the temperatures in the area.
2. Vancouver is on the coast and receives the warming effects of the North Pacific Current, whereas Trail is inland and receives the cold winds of the Arctic air mass.
3. Nearness to large bodies of water tends to moderate winter temperatures.
4. The North Pacific Current which moves along the west coast is a warm current, while the Labrador Current which moves along the east coast is cold. Thus, locations at the same latitude on the east and west coasts can have different temperatures.
5. a. St. John's is on the Atlantic coast and is partially sheltered by Placentier Bay.
b. Windsor is on Lake Erie with Lake Huron to the north. Both bodies of water moderate Windsor's winter temperatures.
c. Prince Rupert is on the west coast and is affected by the North Pacific Current.
6. Large bodies of water have a cooling effect on summer temperatures.
7. The highest average July temperatures are found in the provinces of Ontario and British Columbia. Southern Ontario's proximity to large bodies of water, in addition to its latitude, accounts for its high temperatures. Parts of British Columbia consist of valleys protected by high mountains and remote from large bodies of water, which result in high July temperatures.
8. a. The high altitude of the mountains found in much of British Columbia results in low temperatures; however, during the summer, the temperatures of its coastal regions are moderated by the ocean.
b. The Northland is generally cold because of its altitude and remoteness from warming ocean currents.

C. 1. a. The temperature range of the centres near large bodies of water are: Victoria, 21 degrees; Halifax, 41 degrees; Toronto, 30 degrees; Inuvik, 70 degrees.
b. The temperature range of the centres away from large bodies of water are: Winnepeg, 67 degrees; Calgary, 47 degrees; Peace River, 80 degrees.
2. Generally, centres away from large bodies of water have a greater temperature range than centres near large bodies of water, even though they may be located at the same latitude.

D. 1. In Ottawa, the warmest month is July–August, and the coldest month is January.
2. The two extremes of temperature in Ottawa are 67°F. and 10°F.
3. The temperature range in Ottawa is 57 degrees.
4. The highest precipitation in Ottawa occurs during the summer.
5. July is the wettest month and February is the driest in Ottawa.

E. 1.

CLIMATE	AVERAGE JAN. TEMP.	AVERAGE JULY TEMP.	TEMPERATURE RANGE	ANNUAL PRECIPITATION
West Coast	36°F.	65°F.	29 degrees	60 inches
Continental	−2°F.	60°F.	62 degrees	20 inches
Arctic	−30°F.	40°F.	70 degrees	5 inches

2. a. West Coast
   b. Arctic
   c. Arctic
   d. West Coast
   e. Open answer
3. a. West Coast
   b. Arctic
   c. Continental
   d. Continental
   e. West Coast
4. Open answer

Page 14: POPULATION

A. 1. The highest population densities are found in the southern parts of the provinces.
   2. a. The heaviest population concentrations in Canada are in the Great Lakes and St. Lawrence Lowland areas of Ontario and Quebec (about half of Canada's population is located there), in the southern parts of the Prairie Provinces, and in the coastal Vancouver area of southern British Columbia.
      b. Nine-tenths of Canada's population live within 200 miles of the United States border.
      c. The majority of Canadians live on or near farmland, lakes and rivers.
   3. The greatest concentrations of people in Canada are in southern Ontario and Quebec. These areas have a temperate climate, good soil for agriculture, are near important natural resources such as minerals, water, and forests, have access to markets in other parts of Canada and in the United States, are close to vacation areas, are near the major inland transportation routes of the Great Lakes–St. Lawrence River system, and have seaports available for trade with European markets. Secondary population concentrations are found in the rich farming areas of the southern Prairie Provinces and in southern British Columbia. Climate, vacation areas, natural resources and access to the west coast markets of the United States and Asia satisfy many needs.
   4. Ontario has the largest population of all the provinces. Seven million people, or approximately one-third of the total population of Canada, live there.

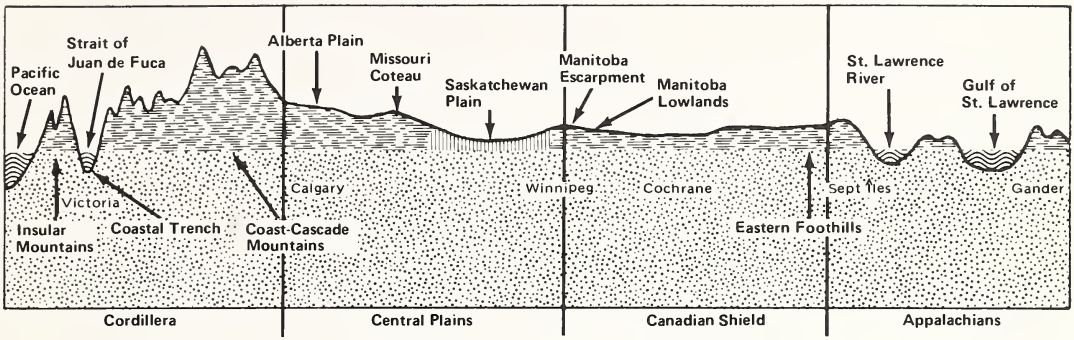
B. 1. In the Atlantic provinces, the coastal population density results from the importance of fishing and shipbuilding in these areas, as well as the lack of transportation facilities in the interior.
   2. There are population concentrations in the river valleys of southern British Columbia, where a moderate climate and rich soil have led to centres of fruit and vegetable farming, and dairying. Mining, ranching and lumbering are also carried on in these areas.

Page 14: PHYSICAL FEATURES

A. 1. The Canadian Shield makes up almost half the total area of Canada.
   2. The Canadian Shield extends through the Northwest Territories, and the provinces of Alberta, Saskatchewan, Manitoba, Ontario, Quebec and Labrador.
   3. The Hudson Bay Lowlands and the Canadian Shield are common to Manitoba, Ontario and Quebec.

B. 1. a. $ 1.00–Central Plains, a land of flat prairies and rich soil.
      b. $ 2.00–Great Lakes and St. Lawrence Lowlands, a land of rolling hills and fertile soil.
      c. $ 5.00–Canadian Shield, a land of dense forests, tundra, rivers and lakes.
      d. $10.00–Cordillera, a land of rugged coasts and high mountains with deep, fertile valleys.
      e. $20.00–Northlands, a land of rugged forests, and Arctic coastal and island areas.
   2. It is 3,100 miles along the 49th parallel from Gander to Victoria; approximately midway between these points is Lake of the Woods.
   3. See Figure 11 and Map 12.

4. See Figure 11 and Map 12, and figure below.



Page 16: TIME ZONES

1. There are 24 times zones around the world. (Each time zone covers 15°of longitude; by dividing 15°into 360°–the total circumference of the earth–one gets 24 time zones.)
2. Universal time zones eliminate the confusion that would result if various areas arbitrarily decided upon their own time schedules.
3. An interval of 15 degrees was selected for the time zones because it takes one hour for the earth to revolve 15 degrees of longitude.
4. Open answer.
5. There are seven time zones across Canada.
6. Newfoundland Standard Time is only half an hour later than Atlantic Standard Time.
7. Daylight is first seen in Canada on the east coast of Newfoundland and last on the coast of British Columbia.
8. When it is 2:00 p.m. in Toronto, it is 11:00 a.m. in Vancouver, 3:00 p.m. in Halifax, 12:00 noon in Yellowknife, and 3:30 p.m. in St. John's.

Chapter 2 THE GREAT LAKES AND ST. LAWRENCE LOWLANDS REGION

Page 18: LOCATION AND EXTENT

A. 1. The three physical regions shown on Map 14 are the Great Lakes and St. Lawrence Lowlands Region, the Canadian Shield Region, and the Appalachian Region.
2. The two provinces containing the Great Lakes and St. Lawrence Lowlands Region are Ontario and Quebec.
3. Three of the Great Lakes border the Lowlands Region: Lake Huron, Lake Erie, and Lake Ontario.
4. The most northern point of the Lowlands is at approximately latitude 48° North (slightly north of Quebec City). The most southern point is at latitude 42° North (Pelee Island in Lake Erie). Approximately 6 degrees of latitude, or about 400 miles, separate these two points.
5. The most eastern point of this region is at longitude 71° West. Its most western point is at longitude 83° West. A distance of 700 miles separates these two points.

B. 1. The Niagara Escarpment runs from Niagara Falls to the western tip of Manitoulin Island in North Lake Huron.
2. The Niagara River drops about 169 feet when it crosses the Niagara Escarpment.
3. The Niagara Escarpment benefits man because the difference in the land level permits the generation of hydroelectric power, thus providing cheap electricity for the surrounding area. The Escarpment provides protection for the orchards in the area. It is also valuable as a tourist attraction. However, the building of roads and railways across the Escarpment is both difficult and expensive. It also made the river unnavigable at this point, and thus necessitated the construction of the Welland Canal to permit ships to move from the Great Lakes to the Atlantic Ocean.
4. Manitoulin Island borders Georgian Bay and forms one end of the Niagara Escarpment.
5. The Canadian portion of the Escarpment is 320 miles long.

C. 1. The extension of the Canadian Shield which divides the lowlands is the Frontenac Axis. This extension passes between Kingston and Brockville.
2. Quebec City is 330 miles north of Windsor.
3. The Saguenay, Chaudière, St. Maurice, St. Francis, Richelieu, Ottawa, Moira, Trent, Don, Humber, Credit, Grand, Thames, Sydenham, Maitland, Saugeen, Nottawasaga, Severn, Muskoka, Magnetawan, French, and Spanish rivers empty into the St. Lawrence River system. (See Map 22.)
   a. These rivers are used for transportation, for sources of hydroelectric power, for irrigation, and for recreation.
   b. These rivers hinder man because they often obstruct travel, cause floods and erosion, and form a breeding ground for mosquitoes and other insects.
4. The Great Lakes Lowlands and St. Lawrence Lowlands are considered one region because they are adjacent areas which have similar climates, soils, and landforms.

Page 19: GLACIATION

1. a. The weight of the glacial ice depressed the land surface.
   b. When the ice of the glacier melted, the water caused floods.
   c. The floods first affected the lower lands.
   d. Floods left deposits of soil in lakes, tending to level the lake bottoms.
   e. When the lakes dried up, the deposits of clay and sand remained to form plains of good soil.
   f. In moving from higher lands, the glaciers scraped rocks along the way.
2. The Champlain Sea did not extend beyond Deep River because the land beyond this point is above sea level.

Page 19: FORESTS

A. Deciduous trees or shrubs shed their leaves annually. Examples of such trees are: maple, oak, walnut, beech, basswood, elm, ash, poplar and hickory. Coniferous trees or shrubs bear cones and are usually evergreens. Examples of such trees are spruce, pine, fir, jackpine, balsam, cedar and hemlock.

B. 1. Two additional factors are: the length of the growing season, and the amount of precipitation in an area.
2. Niagara Forest – deciduous only; maple, oak, walnut, beech, elm, basswood, ash, hickory.
   Central Ontario Forest – deciduous and some conifers; maple, oak, walnut, ash, hickory, hemlock, white pine.
   Upper St. Lawrence Forest – mixed forest; half deciduous, half coniferous.
   Evergreen Forest – mostly conifers, some deciduous; spruce, fir, tamarack, jackpine, poplar, birch.
3. The forests were a hindrance to the first settlers because they had to be cleared for farming, and because they were a barrier to transportation and communication.
4. Wood is used commercially for making paper, as lumber for construction, to provide telegraph and telephone poles, for railway ties, and for the manufacture of furniture and boats.

Page 20: PHYSICAL FEATURES

A. 1. The western part of the Lowlands Region is bordered by Lake Ontario, the Niagara River, Lake Erie, the Detriot River, Lake St. Clair, the St. Clair River, Lake Huron and Georgian Bay.
2. A peninsula is a land area surrounded on three sides by water.
3. The Niagara Escarpment separates central Ontario from western Ontario.

B. Niagara Falls is located at latitude 43° 10′ North, and longitude 79° 8′ West.

C. 1. The Frontenac Axis is part of the Canadian Shield Region.
2. The Monteregian Hills are the remains of volcanoes worn down by erosion and glacial action.
3. Montreal is situated on an island.
4. The rivers which flow into the St. Lawrence are the Ottawa (southeast), Saguenay (southeast), St. Maurice (southeast), Montmorency (southeast), Moisie (south), Manicouagen (south), Chaudière (northwest), Richelieu (north), and St. Francis (northwest). The Laurentians on the north shore and the Appalachians on the south shore of the St. Lawrence River are the main landforms responsible for the direction of the St. Lawrence River's flow.

Page 20: TEMPERATURE

A. 1. Mauve is the color used between the 10° F. and 12° F. isotherms on Map 18.
2. The average January temperature of Windsor is 22° F., and of Ottawa, 9° F.
3. The average July temperature of Toronto is 69° F., and of Montreal, 71° F.
4. Large bodies of water moderate winter temperatures in nearby areas.
5. The low elevation of the surrounding land results in higher temperatures; if the elevation of the area were greater, the temperature would decrease (assuming other climatic variables remained constant).
6. Quebec City is colder than Windsor because it is farther north and because Windsor's temperatures are moderated by Lake Erie and Lake Huron.
7. The average temperatures are:
   a. Windsor in mid-April is 45° F.
   b. Montreal at the beginning of September is 56° F.
   c. Quebec City at the end of November is 20° F.
8. July is the warmest month in all three cities. Windsor is coldest in December; Montreal and Quebec City are coldest in January.

Page 21: PRECIPITATION

A. 1. Forms of precipitation include: rain, snow, hail, frost, dew, sleet and fog.
2. The greatest amount of precipitation shown on Map 20 is over 42 inches; the least amount of precipitation is under 30 inches.
3. The prevailing winds coming from the West pick up moisture as they cross Lake Huron; they lose this moisture as they cross the higher elevations to the east of the lake.
4. The high surfaces of the Canadian Shield and the Appalachian Mountains funnel the prevailing westerlies down the St. Lawrence River Valley.

B. The average monthly precipitations are: Windsor, 2.5 inches; Toronto, 2.7 inches; Montreal, 3.1 inches; Quebec City, 3.3 inches.

Page 21: FROST-FREE DAYS

1. Windsor has more frost-free days than Quebec City because it is farther south, and close to Lake Erie and Lake Huron, which moderate its temperatures.
2. The high altitude of the Blue Mountains results in fewer frost-free days in that area than in areas at lower altitudes.
3. Toronto has 20 frost-free days more than Montreal.
4. a. The more northern the latitude, the fewer the number of frost-free days.
   b. The higher the altitude, the fewer the number of frost-free days.
   c. The closer an area is to large bodies of water, the greater the number of frost-free days.

Page 22: DRAINAGE BASINS

A. 1. a. source: the origin of a stream or river.
   b. mouth: the part of a river where its waters are discharged into another body of water.
   c. delta: a nearly flat plain, formed by deposits of sediment, between diverging branches of the mouth of a river.

d. estuary: the point where the tide from the sea meets the river's current, usually near the mouth of a river.
e. tributary: a river that flows into another, larger body of water.
f. master stream: the principal river of a drainage basin.
g. flow: a term that refers to either a river's direction or its speed of movement.
h. divide: the line of higher ground that is between two adjacent streams or drainage basins. On one side of the divide all the smaller rivers feed the same master stream; on the other side, they usually feed a different master stream.

2. A freighter travelling from Owen Sound to the Atlantic would pass through: Georgian Bay, Lake Huron, the St. Clair River, Lake St. Clair, the Detroit River, Lake Erie, the Niagara River, the Welland Canal, Lake Ontario, the St. Lawrence River system, the Beauharnois Canal, Lake St. Louis, the South Canal, Lake St. Pierre, and the Gulf of St. Lawrence.
3. Rivers and lakes are a source of hydroelectric power, of food, of fresh water for domestic, agricultural and industrial use. They also provide recreational activities–fishing, swimming, boating.
4. The main rivers having their source in the western upland of the Great Lakes Lowland are: the Saugeen River which flows northwest into Lake Huron, the Thames River which flows southwest into Lake St. Clair, and the Grand River which flows southwest into Lake Erie.
5. The Trent Canal connects Lake Ontario with Georgian Bay on Lake Huron. The canal was built to connect the lower and upper Great Lakes. Because the canals and locks cannot accommodate large commercial ships, only pleasure craft use this canal today.
6. Built in 1832, the Rideau Canal links Montreal with Lake Ontario via the Ottawa River.
7. The Welland Canal is used by ships sailing between Lake Ontario and Lake Erie.
8. The Ottawa River is the main tributary of the St. Lawrence River.
9. The Saguenay River empties into the St. Lawrence estuary.
10. The Chaudière, Nicolet, St. Francis, Richelieu and Chateauguay rivers flow into the St. Lawrence River from the south; their source is the Appalachian Mountains.

B. Quebec has the greater potential for using hydroelectric power because the tributaries of the St. Lawrence River drop more sharply and a greater distance (from their source in the Laurentians) than do the rivers of southern Ontario.

Page 23: ST. LAWRENCE SEAWAY

A. 1. Montreal has become the commercial heart of Canada. Among its principal imports are: manufactured goods–non-farm machinery, automobile parts, freight and passenger automobiles, books and printed matter. Among its exports are: wheat (more grain is stored and shipped at Montreal than at any other port on earth), automobiles and accessories, newsprint and wood pulp.
2. The body of water shown in the picture is the St. Lawrence River.
3. Montreal is 150 miles up the St. Lawrence River from Quebec City.

B. The present minimum depth of the St. Lawrence Seaway is 27 feet.

C. 1. Upon leaving the first lock the ship is 38 feet above sea level.
2. By the time it reaches the Iroquois lock it has gone through six locks and has been raised 226 feet.
3. When the St. Lawrence Seaway was under construction, in order to increase the depth of the channel between Cornwall and Prescott, it was necessary to move whole communities back from the shore to higher ground. Earth-moving machines created large holes which were flooded to make new lakes.

D. 1. The Thousand Islands belong to the Canadian Shield Region.
2. The first Canadian Great Lakes port on this route is Kingston.
3. Hamilton is the busiest port on Lake Ontario.

E. 1. Niagara Falls is the greatest barrier to navigation of the Seaway. Ships can bypass it by using the Welland Canal.
a. There are eight locks in the Welland Canal.
b. Lake Erie is 572 feet above sea level; Lake Ontario is 246 feet above sea level. Hence, when the ship is raised from one lake level to other, the increase in elevation is 326 feet.
2. Ships can travel from Lake Erie into Lake Huron, which is eight feet higher, without the use of locks because the rise to a higher level is not sudden; the change in elevation is gradual, spread over many miles.
3. Sault Ste. Marie is the final lock on the westward voyage. It is located at Sault Ste. Marie, and it joins Lake Huron and Lake Superior.
4. Port Arthur and Fort William are the twin cities reached at the end of the trip.
5. Between Montreal and Port Arthur a ship will have been lifted 582 feet and will have travelled 1,200 miles.

6. The process by which a lock lifts a vessel can be described as follows: When a ship approaches the lock, the lower gate is open and the upper gate is closed. The water level within the lock is the same as that of the lower level, thus allowing the ship to sail into the lock. The lower gate and the emptying valve are then closed and the filling valve is opened. This allows water to come in from the upper level. As the water in the lock reaches the height of the water in the upper level, the ship is raised. At the final stage, the upper gate is opened and the ship sails out on the upper water level. By reversing this process, a lock lowers a vessel from one level to another.

Page 27: ELECTRIC POWER

A. 1. To be useful for hydroelectric development, a river must have a strong current and a uniform flow of water, a steep waterfall (natural or man-made), a large volume of water, a location accessible to consumers of the electric power, and suitable sites for the construction of generating facilities.
2. The central part of southwestern Ontario lacks the powerful rivers and the variations in land elevation (resulting in waterfalls) necessary for the production of hydroelectric power.
3. The St. Lawrence River, the Ottawa River, and Niagara Falls are sources of hydroelectric power for the Toronto area. The Montreal area receives power from the St. Lawrence River, the Ottawa River, and the St. Maurice River.
4. Thermal and nuclear power plants have been constructed in the Toronto area in order to meet the demand for electric power that the available hydroelectric power sources could not satisfy.
5. The availability of low-cost electric power in the Toronto area has attracted industries to the Region. They in turn provide job opportunities; therefore the population in the area is growing steadily.
6. The Niagara River is the source of the water for this reservoir.
   a. The reservoir insures a uniform flow of water throughout the year; this constant flow is crucial to the success of a generating plant.
   b. Water from the reservoir reaches the generating station by flowing down the penstocks (closed pipes) to the generator.
7. Hydroelectric plants depend on the weight of falling water for their power and must therefore be larger in size than thermal and nuclear plants, which depend on steam for power.
8. Thermal and nuclear power plants are similar in their dependence on steam for power, although they produce steam by different means. They also use similar machinery in their operations, and both types of power plants must be located near sources of large quantities of water.
9. People raise objections to thermal and nuclear generating stations being built in their locality because of the fear of radiation and of explosions, because they cause air and water pollution, and because the construction of such plants often detracts from the beauty of the physical environment.

Page 30: GENERATING STATIONS

A. 1. Man has used the principle of the water wheel for grinding grain, for sawing logs, for producing electricity, and for running clocks and other machinery.
2. Falling water fills the cups of the water wheel; the weight of this water causes the wheel to turn.
3. The water wheel in a hydroelectric generating station is called a turbine.
4. The greater the height from which the water falls, the greater the force with which it strikes the vanes of the turbine, resulting in a proportionally greater amount of power produced.
5. Electricity is generated as water from the forebay runs down the penstock and strikes with great force against the blades of the turbine. This puts the generator in motion, and electric current is created by friction. After the water is used, it escapes through the tail race into the river.

B. The water that is the source of hydroelectric power is free. As long as water is available, the power plant can continue to supply electric power.

C. 1. When water is heated to a high temperature it gives off steam, which expands and exerts great force when confined. The steam is directed through a small hole against the blades of the turbine. The result is the same as that of water falling on the cups of the water wheel; the steam makes the turbine rotate, thus operating the generator.
2. The boiler in a thermal generating station may be fueled by coal, oil or natural gas.
3. Thermal generating stations are built near sources of water because a great deal of water is needed to produce the necessary steam, and because fuels can be transported over water more easily and economically than by other means.

D. 1. Uranium is the fuel used to create the heat necessary for the production of steam.
2. a. Spent fuel bundles—are stored underwater in tanks for safety.

b. Nuclear generating stations are cleaner than thermal generating stations because they—give off no smoke.
c. Fuel bundles—are cheap to transport and last a long period of time.

Notes on Photographs

Dairy Belt: Farmers in this area raise grain, and hay, grass and vegetable crops suitable for feeding dairy cattle.

Tobacco Belt: The seven small buildings at the left are kilns used in the curing (drying) of tobacco. The red building is a barn; the low building at the right is a greenhouse where young tobacco plants are raised before being transplanted; a farmhouse is partially hidden behind a clump of trees.

Page 33: TYPES OF FARMING

A. 1. The average annual precipitation in this region is 30-40 inches.
2. a. Tobacco grows best in light sandy soil.
b. Truck crops grow best in till.
c. Fruit grows best in clay soil.
d. Corn grows best in till.
e. Wheat grows best in till.
3. The metropolitan areas of Toronto and Montreal provide the largest markets for crops.
4. The most important factor for growing corn is the length of the growing season; for tobacco, the kind of soil; for fruit, the proximity to a market; for dairying, the proximity to a market.
a. Industries associated with corn are food-processing plants and canning factories, and the manufacturers of corn products such as cereals, cooking oils, margarine, and corn meal. Tobacco farming is associated with the cigar, cigarette, pipe, and chewing tobacco industries. Fruit growing is associated with canning industries, food-processing plants, the wine industry, and jams, jellies, and juices. The dairy industry is involved with milk products—butter, cheese, yoghurt, ice cream.
b. Toronto and Montreal are centres for corn milling and processing, and London, Hamilton and Niagara Falls are centres for the manufacture of cake mixes, breakfast foods and other grain-based products. Delhi, Tillsonburg and Simcoe are centres for tobacco farming, while Montreal, Quebec City and Toronto are centres for cigarette and cigar manufacturing. St. Catharines, Hamilton, Leamington, Grimsby and Winona have large fruit canneries and wineries. Ingersoll, Belleville and Brockville are cheese processing centres.

Dairy Belt

A. 1. The large, well-kept barn, attractive house and numerous well-built outbuildings all indicate a prosperous farm.
2. The long low building at the left could be a cattle feeding station. The two cylindrical-shaped buildings are silos; grain is stored in them. In the background are two low buildings which may house milking equipment or other farm machinery. The building with the blue roof is the farmer's house.
3. This farm raises Holstein-Friesian cows, identifiable by their black and white markings; this breed is considered the heaviest producer of milk. Other well-known breeds of dairy cattle are: Ayreshires, a hardy breed; Jerseys, small cows which give very rich milk used for butter production; Guernseys, which produce a rich yellow-colored milk that is used for the production of butter that needs no artificial coloring.
4. The Dairy Belt stretches from about the middle of the southwestern Ontario peninsula down the St. Lawrence River Valley almost to Quebec City. Its width varies from a few miles at the foot of Lake Ontario to a hundred miles in southwestern Ontario.
5. Proximity to markets is the chief factor in the location of a dairy farm because milk must be delivered to the consumer as quickly as possible to prevent spoilage.
6. Modern methods of refrigeration and faster means of transportation have made proximity to markets less essential than in the past.

B. Ingersoll, Belleville, and Brockville are noted for their cheese factories.

C. 1. Hog raising is linked to dairying because milk is used to fatten the hogs. On many farms, the cream is used to make butter and cheese, and the skim milk is fed to the hogs.
2. An average Holstein cow gives 40 gallons of milk a week.
3. The main expenses of dairy farming involve costs of feed, milking machinery, transporting products to market, maintenance, and a refrigeration system for storage.

Tobacco Belt

A. 1. A light sandy soil, a long growing season, warm weather and well-irrigated land are necessary for growing tobacco.
   2. The chief tobacco-growing areas are Essex and Kent counties at the end of the southwestern Ontario peninsula, and Norfolk, Elgin, Middlesex, Oxford, and Brant counties on the north shore of Lake Erie.
   3. Tobacco is difficult to grow because the light, dry, sandy soil needs fertilization, irrigation and protection against wind and water erosion. Tobacco plants must be first raised in greenhouses, and then transplanted. The tobacco leaves must be cured by experts. Frost, hail and cutworms are always a danger and can destroy a crop overnight.
   4. Because tobacco needs a long growing season, the plants must be started early in greenhouses. Only when the frost danger is over can the seedlings be replanted in the open fields. The ripe tobacco leaves, picked by hand, are tied in bundles and hung in heated kilns for four or five days to be dried and cured.

B. Without government controls, farmers would grow more tobacco than the market could absorb at prices that allow for a profit. Without the maintenance of such price levels, smaller farmers might be forced out of business.

Holland Marsh

1. The Holland Marsh is about 30 miles north of Toronto.
2. Farmers, mainly from the Netherlands, were able to farm this area successfuly because of their experience with irrigation and drainage problems.
3. The stream can be seen winding through the middle of the photograph. The drainage canals are the narrow straight lines running across the area at angles. The roads are the straight, light-coloured bands, most visible in the foreground.
4. The main products of this area are onions, lettuce, potatoes, carrots, celery, beets and corn.
5. Trucks and refrigerated railway cars are used to ship this produce.

Notes on Photograph

Holland Marsh: The meandering river indicates a flat land without obstructing rock formations which would tend to restrain the path of the stream.

Niagara Fruit Belt

A. 1. The boundaries of the Niagara Fruit Belt are the Niagara River, the Niagara Escarpment, the city of Hamilton and Lake Ontario.
   2. The clay loam soils of this area were once glacial deposits in Lake Iroquois.
   3. The cold water of Lake Ontario keeps the spring temperatures down; this delays the blossoming of the fruit trees until after the last frost. If frosts occurred during the blossoming period, they would prevent the growth of the fruit.
   4. The town on this map is Grimsby, located on the south shore of Lake Ontario. It is 11 miles east of Hamilton, and about 50 miles from Toronto.
   5. The main highway passing through this area is the Queen Elizabeth Highway. It provides a rapid transportation route for shipping produce to canneries and markets.

B. 1. The highway has encouraged developments in housing and industry because it provides easy, rapid access to urban areas.
   2. Another location for a highway might be on the plain above the Niagara Escarpment, away from the orchards. This might require building a causeway over the water.
   3. Elevation is indicated by the pink contour lines on the map.
   4. The Niagara Escarpment extends across the map from east to west directly south of Grimsby. Most of the orchards are located below the Escarpment because the climate in that area is milder and the growing season is longer, because its sandy soil is better suited to fruit growing, and because the Queen Elizabeth Highway provides the best transportation route to market centres.
   5. The Escarpment acts as a windbreak which shelters the orchards from the cold winter winds blowing from the south.
   6. Fruits grown in this area include apples, pears, plums, peaches, cherries and grapes.
   7. The best soil for growing grapes is rich clay loam.
   8. Major considerations in buying a farm in this area would be the quality of the soil, the climate conditions, and access to transportation facilities. One would also avoid locating near industrial areas that might pollute the air and water.

Notes on Photographs

Vertical Aerial Photograph of the Grimsby Area: The filtration plant is located at the upper right centre of the photograph, on the inlet. The hospital is the dark building in the left centre of the photo. The main highway is the straight wide band going from the upper left corner of the photograph diagonally to the right.

Niagara Fruit Belt: The trees here are apple trees; their blossoms indicate that the photograph was taken in the spring.

Montreal Plain

A. 1. All the houses are located near the road.
2. Open answer.
3. The fields are in the shape of long narrow rectangles extending from the road to the river. Before the highway was built, the only means of transportation was the river; therefore, to insure access to means of transportation, the farms were built on the river fronts.
4. Since the shadows point north, the photographer was facing west.
5. The land here is very flat.
6. The metropolitan area of Montreal provides the main market for the farm produce.
7. As the cities expand, farmland is being taken over for industrial and housing purposes.
8. The Great Lakes Lowland has warmer summers, a longer growing season, and slightly milder winters than the St. Lawrence Lowland.
9. a. In Quebec, apples are grown on the island of Mount Royal and around Montreal. These areas have rich clay soil, sufficient rainfall, and a longer growing season than other parts of the province.
b. Tobacco is grown to the north of Montreal around Joliette, especially in the sandy soil north of Trois Rivières.
c. Dairy farming is found throughout Quebec, where sufficient rainfall provides good pastures, and helps the growth of hay. The area around Montreal is also good for dairy farming; it supplies a major consumer market.
d. The government of Quebec operates a sugar beet refinery at St. Hilaire on the Richelieu River near St. Hyacinthe, about 20 miles east of Montreal. This location was chosen because the river supplies the great quantities of water needed in the refining process, and because the fertile soil is suitable for the production of sugar beets.

B. Farming in the Dairy Belt is a year-round job. The cattle must be constantly cared for; in the summer they are turned out to pasture, but hay must be grown and stored so that the cattle can be fed in the barns during the winter.

In the Tobacco Belt, spring is the time for soil preparation and the growing of seedlings; during the summer, the primary work of planting, harvesting and curing is done.

In the Holland Marsh, preparing the fields and planting is done in the spring. Harvesting occurs in the fall, and maintenance of the drainage canals is a year-round activity.

In the Niagara Fruit Belt, the busiest season is from June to October when the fruit is picked. In the early spring, trees are pruned and sprayed.

Page 37: MINING

A. 1. Map 27 provides the information for parts "a," "b," and "c." The following are some of the uses of the minerals shown on the map:

salt–fine salt is used in chemical industries, and for seasoning food; coarse salt is used for curing fish and hides, for refrigeration, and to make icy highways safer.

gypsum–is used in fertilizers, plaster of paris, paints and portland cement.

limestone–is used in the manufacturing of cement, steel, lime, and glass, in the pulp and paper industries, in the processing of sugar beets, and as a construction material.

sandstone–is used in construction and for grindstones.

marble–is used in statues, furniture, and decorative objects.

asbestos–is used as an insulating material, in plastics, floor tiles, brake linings, and textiles.

fluorspar–is used in the chemical industry, and in the production of glass and enamel.

soapstone and talc–are used in roofing materials, rubber, paint, and in the cosmetic industry.

2. Southern Ontario produces a great quantity of building materials to meet the needs of its large population and many industries. Limestone is essential for the manufacture of cement, a cheap and durable building

material. Marble is used in construction primarily for its aesthetic value, but has the disadvantage of wearing poorly when exposed to the elements. Granite, because it is hard, provides the most durable building material, but is expensive to mine.

B. 1. Open-pit mining involves a process whereby a huge pit or hole is dug in the ground and the ore is removed by machines. This method is feasible only where ore resources are found close to the surface of the land. Heavy-duty machinery—steam shovels, bulldozers, loaders and trucks—is used.

2. Other mining methods involve the costs of building shafts and tunnels, and of equipment for hoisting, drilling, ventilation and lighting. Hence, open-pit mining is cheaper. It is also safer for the miners because there is no chance of underground tunnels collapsing.

Notes on Photograph

Open-Pit Mining: Cement is made by grinding limestone to a fine powder, mixing this powder with a solution of clay and water, and then drying the resulting mixture. The material that remains is then ground up and mixed with crushed gypsum.

Page 38: NATURAL GAS AND OIL

A. 1. The principal natural gas fields of southern Ontario are in Lambton, Kent and Haldimand counties, on the south shore of Lake Erie, west of the Niagara River, and in the vicinity of the St. Claire River.

2. Most of the natural gas used in the Lowlands Region comes from Alberta and Saskatchewan.

B. 1. Natural gas is chemically converted into rubber, nylon garments, antifreeze, toothpaste and ammonia for fertilizer.

2. The use of natural gas in the home is measured by a gas meter.

C. 1. Gas companies add a strong smell to natural gas, thus allowing leaks to be detected.

2. Natural gas is obtained by drilling in much the same way as for oil. Oil and gas are often found together, a pool of gas lying above a pool of oil.

D. 1. Sarnia, Toronto and Montreal are close to oil refineries; Montreal is the main centre of oil refining.

2. Toronto receives its oil from Oakville, Clarkson and Port Credit, which get crude oil by pipeline from Edmonton. Toronto also obtains oil from the Montreal area, where crude oil arrives from South America by tanker.

3. Pipelines, once built, cost less to use than other means of oil transportation.

4. To lay a pipeline, a deep trench is dug. Then sections of pipe are laid beside the trench, joined together, and wrapped in a protective covering. The joined pipe is then lowered into the trench and covered. Pumping stations are built along the pipelines to keep the oil moving, and helicopters patrol the lines to check for possible leaks and breaks.

E. 1. Products found in the home that are refined from oil are: gasoline, coal oil (kerosene), lubricating oil, wax, and grease.

2. Scientists believe that oil was formed from organic material (plants and animals) found in the sea millions of years ago. Over long periods of time, this material was transformed into hydrocarbon and covered with silt and sediment. Under heat and pressure, the solid hydrocarbons broke down, producing oil. Because the oil was lighter than the surrounding rock, it seeped upward until it collected beneath a layer of rock too hard for it to penetrate.

Page 39: TRANSPORTATION

A. 1. As railways grew, large areas of land that had been previously inaccessible were opened to settlement. Industries were attracted by the railways; they created job opportunities, and therefore the population increased.

2. The transcontinental railway unified Canada by linking British Columbia with eastern Canada, and opened the Prairies to settlement.

3. The two transcontinental railways, the Canadian National Railway and the Canadian Pacific Railway, have competed successfully with other forms of transportation by providing faster, more efficient service, such as piggy-back truck trailers, refrigerated box cars, and oil tankers, and by effective advertising.

4. Diesel engines are cheaper, quieter, and cleaner than steam engines, and the oil used to power diesel engines is easier to ship and handle than the coal for steam engines.

5. The major railway centres of this Region are London, Brantford, Toronto, Ottawa, Montreal and Quebec City.

6. a. Railways are important to industry because they transport raw materials and finished products, and they can be located near industrial complexes.

b. Railways are important to farming because they transport machinery, fuel, fertilizer and manufactured goods to the farmers, and carry farm produce to markets.
c. Railways are important to individuals because they provide a cheap, comfortable and efficient means of travelling to most parts of the country.

7. The railway companies might have opposed the building of the St. Lawrence Seaway because the Seaway's ability to carry cargo ships would present competition for the railways.

B. 1. In the early days of Canada's history, horses and wagons were scarce; furthermore, forests, swamps and rocky ground made road building difficult. However, the many lakes and rivers provided canoe and portage routes for much of the country.
2. During this period, canoes were the main water craft. They carried goods for trading with the Indians, and food supplies and building materials for the settlers in the interior of the country. They returned with furs, skins and game.
3. Early settlements were built along water routes because these provided the main means of communication and transportation.

C. 1.

CANAL	ORIGINAL USE	LENGTH OF SYSTEM	TODAY'S USE
Rideau	A defense measure built so that the United States could not cut off Upper Canada from Lower Canada by seizing the International Rapids.	130 miles	For pleasure craft
Trent	To provide a shorter route for carrying freight between Lake Ontario and Georgian Bay.	283 miles	For pleasure craft
Welland	To enable ships to bypass Niagara Falls in going from Lake Ontario to Lake Erie.	28 miles	For the original use

D. 1. Iron ore and concentrates, grain (wheat, oats, barley, rye, and flaxseed), newsprint, pulpwood, and wheat flour are carried from the Lakehead to eastern ports.
2. Gasoline, fuel oil, machinery, farm products, and manufactured goods are carried from the eastern ports to the Lakehead.
3. Sending freight by ship is cheaper than by train or truck, and ships can carry greater quantities.
4. Weather is a major problem when the Seaway freezes over during the winter and cannot be used. Experiments are being made to discover whether air forced through pipes at the bottom of the Seaway can create enough turbulence in the water to prevent its freezing.

E. 1. There are more than 83,000 miles of highway in Ontario, and more than 54,000 miles in Quebec.
2. There are few major roads running north from the St. Lawrence River between Trois Rivières and Quebec because the highlands of the Canadian Shield are close to the river in this area and present an obstacle to road building. In addition, the sparse settlement in this area does not necessitate major roads.
3. Provincial governments obtain most of their revenue for building and maintaining highways from taxes on gasoline and oil.
4. The increase in the number of good roads has made the trucking industry an important competitor for the railways' business.
5. Good roads help industries, farms and consumers, by providing fast transportation for raw materials and finished products. They allow tourists greater independence and scope in their travels; people can select their routes and plan their own travelling time.
6. A Province of Ontario road map will show that:
a. Mileage is indicated by black numbers between black stars showing the location of the two nearby centres.
b. Mileage between two large centres is given in a separate mileage chart on the map.
c. North Bay is 279 miles from Niagara Falls. The best route for this trip is to take Highway 11 south to Highway 400, proceed south on Highway 400 to Highway 401, then west on Highway 401 to Highway 27, then south to the Queen Elizabeth Way, which goes around the end of Lake Ontario, through Hamilton, to Niagara Falls.

F. 1. Because of the speed of the airplane, the time it takes to cover long distances has been greatly reduced. Therefore, in terms of communication and transportation, the invention of the airplane shrank the size of the world.

2. Air Canada and Canadian Pacific Airlines are Canada's two main airlines.

3. a. By airplane, the distance between Toronto and Quebec City is 460 miles; the travelling time is 2½ hours, and costs $36.00.
   b. By rail, the distance is 513 miles; the travelling time is 9 hours, and costs $12.00.
   c. By road, the distance is 505 miles; the travelling time is 10 hours, and costs $12.50.

   These figures are averages. Among variables affecting them would be the type of airplane used, the day of the week that the trip is made, and the speed at which the automobile is driven.

G. 1. A piston engine operates in much the same way as a motor car. Exploding gasoline vapour in a cylinder causes a piston rod to move back and forth and supply power to operate the propeller of the plane.

   A turboprop uses a turbine (a wheel equipped with vanes) instead of a cylinder. The force of the exploding gasoline vapour acts on the vanes to make the wheel rotate. The power from the wheel is transmitted to the propeller.

   A jet uses the engine to condense air, rather than to turn the propeller. This air is released as a powerful jet and acts against the air outside to push the plane forward. Jets are replacing piston engines because they operate at higher speeds, thus reducing flying time.

2. a. If auto transports (trucks that can carry four or five vehicles) were available, the best way to transport automobiles would be by road. There would be no problems in getting the cars to and from a plane, train, or boat; they could be delivered directly to their destination.
   b. A wrist watch should go by airmail. The cost for such small articles would be relatively low.
   c. Strawberries should be shipped in a refrigerated railway car to prevent spoilage.
   d. Flowers should be shipped by air because speed is important to keep the flowers alive.
   e. Petroleum should be transported in tank trucks. It can then be delivered directly to its destination; this could not be done if boats or trains were used.
   f. Cattle are usually transported by train. They take up a lot of room, and few ships are equipped to give livestock proper care.
   g. Open answer.
   h. Lumber is bulky and heavy. Since speed is seldom essential, ship transport might be most practical.
   i. Furniture is also heavy and bulky, but any moisture, even in the air, might cause serious damage; therefore, it should go by train.
   j. Heavy machinery is least expensive to transport by boat.

Page 41: MANUFACTURING

A. 1. a. Logs–pulp and paper products, doors and window frames, tools, sporting goods, furniture.
   b. Iron ore–machinery, electrical equipment, auto parts, tools, steel.
   c. Farm produce–processed foods and beverages, tobacco.

2. About 80 percent of all Canadian manufacturing is done in Ontario and Quebec.

B. 1. a. About half the people in Canada live in this area, thus providing a large skilled labour force.
   b. This region is closer to a greater variety of raw materials (mineral and agricultural and forest resources) than any other part of Canada.
   c. Its high population concentration provides an immediate market; its proximity to the United States and its seaports also provide foreign markets for the region's products.
   d. The region is on the St. Lawrence Seaway; it has the best transportation facilities of any region in Canada.
   e. The region has abundant and cheap hydroelectric power (three-quarters of the hydroelectric power generated in Canada comes from Ontario and Quebec).

2. Montreal–garment industry, cigarette manufacturing.
   Shawinigan–aluminium.
   Trois Rivières–paper, textiles.
   Oshawa–automobiles.
   Windsor–automobiles, trucks, tractors.
   Hamilton–iron and steel, automobile parts.
   Toronto–heavy machinery, greatest manufacturing centre.
   St. Catharines–farm implements, electrical appliances.

Sarnia–oil refining, chemicals.
Kitchener–furniture, clothing.
London–diesel railway engines, electric equipment.

3. The following are some factors that affect the price of a manufactured item: the cost of the raw materials, of capital goods, electric power, labour, land, transportation, storage, advertising, and taxes.
4. A good location for a canning factory would be St. Catharines. The produce is grown nearby; cheap electric power is available from Niagara Falls; nearby heavily populated areas provide a labour force; the area is well-served by both road and rail transport facilities; and there are markets close-by, both in Canada and the United States.

C. Open answer.

D. 1. Golden Horseshoe is a good name for this area because this is the most densely populated, most highly industrialized and wealthiest part of Canada. "Golden" refers to the wealth of the area; its shape resembles a horseshoe. The main industry of Guelph is electrical equipment (transformers); of Waterloo, electronic equipment; of Kitchener, food processing; of Galt, foundries and iron works; of Brantford, farm machinery.

2. Because of its fine hardwood forests, important industries were lumber, wood products, and furniture making, which are still found in several centres today. Fertile soil and a mild climate make the land ideal for mixed farming and dairying. The area is still noted for its cheese, meat packing, and food processing industries.
   a. Because furniture-making is a highly skilled craft, often passed on from one generation to the next, it has continued to be important here.
   b. Industries generally develop along main transportation routes. Industry has not grown as rapidly in the Grand River Basin as in the Golden Horseshoe because it is more remote from major transportation facilities. There are no important ports along the west end of Lake Erie or on the east coast of Lake Huron.

E. 1. a. A steel mill–manufacturers of hardware, farm implements, electrical appliances, automobiles.
   b. An electrical company–manufacturers of wire, porcelain, light metals, appliances.
   c. An oil refinery–manufacturers of chemicals, paint, lubricating oils and greases.
   d. A tannery–manufacturers of shoes, leather goods, clothing.
   e. A paper-making company–manufacturers of paper products such as stationery, tissues, boxes.
   f. A flour mill–manufacturers of cereal products, baked goods, cake mixes.

2. Industries that select sites outside metropolitan areas have the advantages of cheaper land, greater potential for expansion because of the land available, and probably less competition from rival industries. However, transportation facilities might be less accessible than if the industries were located in urban centres.

F. The following calculations indicate that it would be more practical for an industry serving both Montreal and Toronto to locate in one of those cities than in a city between them such as Kingston. (The figures are based on a situation wherein the hypothetical industry produces 6,000 pounds of goods per day, half to be sold in Montreal, and the other half in Toronto.)

a. Industry located in Toronto
   cost of shipping 3,000 pounds to Toronto: nominal
   cost of shipping 3,000 pounds to Montreal: 30 x $2.97 =$ 89.10

b. Industry located in Montreal
   cost of shipping 3,000 pounds to Montreal: nominal
   cost of shipping 3,000 pounds to Toronto: 30 x $2.97 =$ 89.10

c. Industry located in Kingston
   cost of shipping 3,000 pounds to Toronto: 30 x $2.78 =$ 83.40
   cost of shipping 3,000 pounds to Montreal: 30 x $2.08 =$ 62.40
   Total =$145.80

Notes on Photograph

Automobile Industry: In a production line, each worker does the same job on each part of every automobile. He becomes adept at his specialized role. Because the production line system is fast and efficient, it is a less expensive method of production than one where workers are responsible for several operations involving many tools and skills.

Page 44: IRON AND STEEL

A. 1. a. Coal from Pennsylvania is easily imported over water routes.
   b. Limestone is easily obtained from the Niagara Peninsula.
   c. An unlimited supply of water is available from Lake Ontario.

d. Iron ore from Atikokan and Minnesota can be transported on the Great Lakes.
e. The Niagara River, located a few miles from Hamilton, supplies hydroelectric power.

2. a. Coal is the principal fuel used in steelmaking. Before it is used, it must be made into coke. This is done by baking the coal in an air-tight furnace so that the inflammable gases will not escape. Coke is harder than coal and is not crushed when mixed with limestone and iron ore. Coke burns with a hotter flame and is cleaner.
   b. Limestone, together with coke and iron ore, is put into a blast furnace. It combines with the rock of the iron ore and other unnecessary minerals to form a slag that can be run off from the furnace separately. The molten iron is heavier than the slag and sinks to the bottom of the furnace. From there it is run off into moulds or "pigs" from which it takes the name "pig iron."
   c. Water pipes are connected to the furnace's heat-resistant brick lining. They help to draw off heat from the brickwork and prevent it from being cracked or broken.
   d. Iron ore is the rock that contains the actual iron. When the iron is separated from the rock, it is made into pig iron, which is one of the principal materials in steel.
   e. Electricity is used to operate the rolling mills that roll out the molten ingots of steel into the required shapes and sizes.
3. Hamilton is closer to sources of raw materials than Toronto, Fort William and Schefferville, and closer to markets than the latter two cities.
4. Listed in order of importance, the following are the most significant factors with regard to Hamilton's steel industry:
   a. Good market for products. Without a demand for steel, the industry would have to close down.
   b. Nearness to raw materials. For every ton of steel produced, almost three tons of raw materials—coal, limestone, and scrap iron—are needed. This means that the cost of importing raw materials is much greater than that of exporting the finished product.
   c. Cheap and abundant power. A great deal of machinery is necessary to operate a steel plant. Without a cheap and ample supply of power, a plant would not be able to operate economically.
   d. Skilled workers. Skilled workers are more readily obtained than the other three factors.
5. a. Iron is a metallic mineral, the most widely used of all minerals. It is found in a form known as iron oxide. When rock containing this oxide is mined, it is known as iron ore. The ore is smelted in blast furnaces to produce pig iron, used in the manufacture of steel, cast-iron, and wrought iron.
   b. Steel is an alloy, or mixture, of iron and carbon. Elaborate processes are necessary to produce steel from coal, pig iron, and scrap iron.
   c. An ingot is a metal casting in a shape suitable for rolling or forging.
   d. Slag is the waste product remaining after a metal has been separated from its ore.
   e. The primary steel product is the result of the first stage of production: steel bars, plates, and ingots.
   f. The secondary steel product is the article made from the primary product.
   g. Pig iron is the crude iron produced in the blast furnace and cast into moulds, or "pigs," which are used in making steel, cast-iron, or wrought iron.
   h. Coke is a fuel made from coal that has been heated in an oven until certain gases have been driven off. When burned, coke produces great heat. Coke is almost pure carbon.
   i. A coke oven is an air-proof oven in which coal is subjected to great heat. This drives off the volatile substances and produces coke.
6. Coke, limestone, and iron ore are put in the blast furnace in layers. By injecting hot air into the furnace, the coke burns more fiercely. The intense heat results in the whole mixture becoming a liquid mass. The limestone combines with the melted rock of the iron ore and with other unwanted minerals. This part of the liquid is lighter than the molten iron and rises to the top of the furnace, where it forms what is known as slag. The iron is drained off into moulds (or "pigs").

B. The basic oxygen furnace is charged with limestone, scrap metal and high-grade pig iron. The fuel used to heat it is natural gas, gas from the coke oven or blast furnace, or oil. These fuels are blown into the furnace; then hot air is injected, which further intensifies the heat produced by the fuels. The great heat burns out impurities in the pig iron, and molten steel is produced. Small amounts of other minerals are added: manganese to make the steel stronger, carbon to make it harder without being brittle, and chromium or nickel to make it stainless. The liquid steel is run off into forms to dry into ingots. In the soaking pit, the ingots are heated to an even temperature throughout, and then sent to the rolling mills. These mills roll out the steel in strips, bars, wires, or whatever shape is desired.

Notes on Photograph

Steel Industry: Four factors favouring the location of a steel plant on Hamilton Harbour are: availability of railway lines, of water transportation, of water for power, and of a labour force (indicated by Hamilton's large population).

Page 46: TROIS RIVIÈRES AREA

A. The surface of this plain is flat, and the soil, a sandy loam, is fertile. However, in some areas the land is too swampy for cultivation.

B. Hay farming supports dairy farming.

C. 1. Map 33 indicates that the urban population is approximately 124,000. Therefore, the total population of this area is about 248,000.

2. The most suitable crop for the sandy soils north of Trois Rivières is tobacco.

3. Trois Rivières is located at the junction of the St. Lawrence River and the St. Maurice River.

4. a. The St. Lawrence River serves Trois Rivières as a transportation route: to bring certain raw materials to its factories, to export other raw materials, and to export its finished products.

b. The St. Maurice River provides access to northern areas which supply Trois Rivières with timber for its pulp and paper mills. The river is also an excellent source of hydroelectric power.

D. 1. Trois Rivières' most important export is pulp and paper.

2. Trois Rivières is the port for the industrial centres of the St. Maurice River.

3. Because of the many dams and power installations on the St. Maurice River, it cannot be used as a water transportation route.

E. 1. The run-off caused by melting snow accounts for the heaviness of the spring flow.

2. This flow has been regulated by the construction of large dams and reservoirs which conserve the supply of water and maintain a constant rate of flow.

3. Drummondville's chief industry is textiles. Louiseville, in addition to producing textiles, is a centre for lumbering.

4. Trois Rivières' location on the St. Lawrence River, its access to hydroelectric power generated on the St. Maurice River, and its proximity to sources of timber and limestone have made it a major industrial port.

Notes on Photograph

Shawinigan: Two important activities of this centre are the pulp and paper industry and the development of hydroelectric power.

Page 48: TORONTO

A. 1. The southern part of Toronto was once under the water of glacial Lake Iroquois. The lake's continuous wave action created a relatively flat surface. The northern part is hilly because of moraines created by melting or retreating glaciers.

2. The bluffs running from east to west across Toronto were once the shoreline of the glacial lake.

3. The steep hills, when they freeze over in winter, make driving difficult and cause traffic congestion.

4. The meandering flow of these rivers occurs over a long period of time; therefore, they would be very old.

B. 1. A spit is a narrow, low-lying tongue of sand, gravel, or clay projecting into an ocean or lake, and attached to the land at one end. Lake Ontario wore away the soft clay of the Scarborough Bluffs. The lake's current carried the eroded material westward along the shore. When it met the current of the Don River, the lake current slowed down, releasing silt. This Don River deposit formed a spit; when a storm broke its connecting link with the shore, this deposit became Toronto Island.

2. The island protects ships in Toronto harbour from bad weather.

3. A current flowing down the middle of a lake or river causes water along the shore to flow in the opposite direction. In Lake Ontario, the main flow down the middle of the lake is eastward, but along the shore, the current flows westward.

C. 1. Toronto was a meeting place for French traders and Indians selling furs.

2. Toronto was the southernmost point on the Indian portage route between Lake Huron and Lake Ontario. Here furs were unloaded from the backs of portagers into canoes for the trip down Lake Ontario. It was a natural location for a fur-trading post.

D. 1. The site had a good harbour, and the level land allowed for settlement. Convenient to other settlements and trading posts, its location on the north side of Lake Ontario made it fairly safe from attack by the United States.

2. It is about 5½ miles from the harbour to the north limits of Toronto. It is about 6¼ miles along Bloor-Danforth from the west limit to the east limit of the city.

E. 1. a, b, c. It is suggested that the students obtain this material as a research project.

c. (ii) The river valleys were a hindrance to travel and necessitated the building of costly bridges so that Toronto could expand east and west. Now, however, the Don Valley is a major transportation artery which funnels traffic into the centre of the city.

2. The locations of the industries listed were affected by various factors:

a. Light iron—nearness to: railways, rivers for waste disposal, related industries, markets.

b. Paper products–nearness to: related industries, markets.
c. Warehouses–nearness to: railways, a harbour, related industries, markets.
d. Flour mills–nearness to: railways, a harbour, related industries, markets.
e. Food processing–nearness to: railways, markets.
f. Petroleum–nearness to: railways, a harbour, related industries, markets.
g. Metal scrap–nearness to: railways, a harbour, related industries, markets.
h. Paint and chemicals–nearness to railways, rivers for waste disposal, markets.

3. Toronto has a good location because it is bounded on three sides by fertile agricultural areas, surrounded by prosperous industrial and manufacturing centres, and it has good water, rail and road connections with other parts of the Lowlands, with the rich mining areas of the Shield, and with the United States. Toronto's climate is temperate, and it has an excellent natural harbour. However, the city's numerous ravines and valleys necessitated the construction of costly bridges; and the escarpment which runs east-west through the centre of the city prohibits railroad construction and creates traffic congestion during the winter.

Notes on Photographs

Toronto Harbour: The scene is the east end of Toronto Bay as shown in Figure 27. The Eastern Gap, from the harbour to the open water of Lake Ontario, is prominent in the left foreground of the photograph, and can be found on Figure 27.

Toronto Looking East: Industries served by Toronto's rail and harbour facilities are: chemical products, electrical machinery and appliances, food processing, metal products, transportation machinery and equipment, rubber goods, metal refining and smelting, textiles and clothing, oil refining, and wood products.

Page 51: MONTREAL

A. Ships from Europe stopped at Montreal because they were too large to navigate the rapids of the St. Lawrence River.

B. Transshipment refers to the unloading of cargo from one means of transportation, and reloading it onto another, for example, from a truck to ship. During the days of fur trading, sailing ships handled traffic on the St. Lawrence River to Montreal, but in going upriver from Montreal, large canals and Durham boats (similar to bateaus) were used. These carried furs to Montreal, where they were transhipped to sailing ships which carried the furs to Europe.

C. The railway line between Montreal and New York runs from north to south.

D. 1. The population of Montreal, according to the 1966 census, is 2,436,817.
   a. The city covers about 60 square miles.
   b. Open answer.

E. 1. Mount Royal, in the centre of Montreal, is the predominant landform. It is the remains of a volcano.
   2. Because Montreal is a seaport, its commercial and industrial areas are located primarily around the harbour.
   3. The St. Maurice River provides Montreal with its electric power.
   4. Montreal is a successful manufacturing centre because it is located on an important travel route, it has a good harbour, it has easy access to a variety of raw materials, and it has a large population which provides both a market and a labour force.

F. 1. a. Summer vegetables–the St. Lawrence Lowlands.
   b. Dairy products–the outlying areas of Montreal.
   c. Summer fruit–the slopes of the Monteregian Hills.
   2. a. Montreal's climate, neither too dry nor too damp, is favourable to the yarns used in the textile industry.
   b. Montreal's large population provides an immediately available labour force.
   c. Montreal has access to cheap hydroelectric power.
   d. Montreal is one of the most heavily populated areas in Canada. Therefore, excellent markets are close at hand for the garment industry.

G. 1. Montreal's location provides easy access to:
   a. Eastern Canada and the northeastern United States via the St. Lawrence River and the Atlantic Ocean.
   b. New York via railway, road or Lake Champlain.
   c. Southwest Ontario and the midwestern United States via the Great Lakes.
   d. Western Canada via the Ottawa Valley. (See Map 36.)
   2. a. The distance from Montreal to New York is 1,700 miles.
   b. The distance from Montreal to Toronto is 350 miles.

c. The distance from Montreal to Ottawa is 110 miles.
d. The distance from Montreal to Quebec City is 160 miles.

3. At ocean ports, tides are a serious consideration. Dock facilities must be able to handle shipping at high and low tides, and arrivals and departures of ships depend to a great extent on the times of low and high tides. Tides also make it difficult to guide ships past dangerous reefs and shoals. Hence, Montreal has an advantage as an inland port.

H. 1. The harbour is closed because of ice from about the middle of December to the middle of April. These times may not seem to agree with the climatic graph on page 21, but the temperature statistics refer to the atmosphere; water takes much longer to heat and cool than air.
2. During these months, Halifax can serve as a centre for transshipment.
3. Ocean passenger liners, as well as freighters, are important to Montreal's economy.
4.

INDUSTRY	SOURCE OF RAW MATERIAL	DESTINATION
meat-packing	Alberta and other agricultural areas in Canada	Europe
flour milling	Saskatchewan and other agricultural areas in Canada	Europe
oil refining	South America	Canadian centres
textile milling	Canada and the United States	Canadian centres
sugar refining	West Indies	Canadian centres
gypsum-processing	Canada	Canadian centres

Notes on Photograph

Montreal Harbour: The pier in the very front and centre of the photograph is Bickerdyke Pier. The other piers in the centre of the photograph are, from front to rear: Alexandra Pier, King Edward Pier, Jacques-Cartier Pier and Victoria Pier.

Page 54: GROWTH

A. 1. a. As a centre grows in importance, old industries expand and new industries develop. Many new jobs are created which attract people to the centre. As the population grows, services (fire, police, transportation, light, heat, and power), civic administration, education, sports, and entertainment facilities develop and expand.
b. Although many people must work in city centres, a great many people prefer to live outside the city where conditions are less crowded, where the cost of living is lower, and where the physical environment is perhaps more desirable. Improved methods of travel—cars, buses, and fast rail service—make it possible to work in the city and have a home in the suburbs.
c. As the suburbs become heavily populated, their advantages in terms of living conditions and easy access to the city may decrease. This may encourage some suburban dwellers to return to the centre of the city, which offers easy access to shopping, and a wide range of entertainment facilities. The recent emphasis on urban renewal projects may also make the city more desirable than before.
d. Land, housing and apartment costs are governed by the law of supply and demand. A mass movement from the suburbs to the city would create a demand for living quarters greater than the supply available.
e. As a city expands, land becomes scarce and valuable. Developers build on every available square inch. Without intelligent planning in advance, sufficient land may not have been set aside for new highways and roads to accommodate the increased number of vehicles.

B. 1. a. Because the buildings are taller, more people can live on the same amount of land. The living quarters are modern and more desirable, space for recreation is available, and parking facilities are provided.
b. As the population has grown and land has become more expensive, housing has expanded vertically.

2. a. Although they live close together, people in apartment buildings tend to have little contact with their neighbours.
b. Often, children do not have the opportunity to play in their own yards and gardens or to keep their own pets.

c. Because they live in a building owned by someone else, the tenants do not have the responsibility of maintenance. However, they have the disadvantage of not being able to reap the benefits of improvements they make in their living quarters. If they increase the value of the property, the landlord profits, not the tenants.

C. 1. a. The "rush-hour" refers to the heavy flow of traffic that occurs twice a day—in the morning when people are going to work and in the early evening when they are returning home.

b. Steps to alleviate traffic congestion might include: building more highways, increasing the means of public transportation available, using one-way streets in the direction of heavy traffic, convincing motorists to leave their cars at home and use public transportation, and persuading businesses and industries to stagger their working hours so that their employees go to work and return home at different times of the day.

2. During the winter, Toronto has heavy snowfalls. If the subway were not covered, it might become clogged and inoperable.

3. Two reasons for the disappearance of orchards are the encroachment of industry, and of residential construction. The flat terrain and the good transportation facilities lend themselves to such use of the land. (Note the factory and the row of houses in the photograph.)

4. Loss of farmland could be controlled by government regulation, whereby certain areas might be set aside for growing fruit only.

5. The suburban dwellings are located to the left of the highway (in the foreground of the photograph).

6. Long, straight streets encourage fast driving. Residential areas with such streets would suffer from noise, air pollution, and danger from fast automobiles and trucks. Winding streets tend to discourage fast driving and perhaps restrict traffic to the people who live or have business in the area.

7. To the right of the suburb is a wide, multi-lane highway, and beyond that, factories.

8. Advantages for industries locating outside the city are: land is cheaper and taxes are lower; there is room for expansion; they can locate on a major transportation route; problems caused by traffic congestion and lack of parking facilities are not as great.

9. Modern means of travel—automobile, subway, and commuter railway—have made it possible for people to travel from homes in the suburbs to their jobs in cities quickly.

D. 1. a. Smoke from factories and ships can kill vegetation, create smog and dirt, wear away building façades, reduce visibility, detract from the appearance of a city, as well as injure the health of its inhabitants.

b. Fumes from cars, trucks, and buses can do serious harm to the health of human beings and animals.

c. Contaminated water can poison fish and waterfowl, and ruin lakes and rivers as a source of drinking water and means of recreation.

Solutions might involve: the development of technological devices that will reduce pollution, and process waste material; the use of cleaner fuels; the enactment and rigid enforcement of pollution control laws; the zoning of urban and residential areas so as to prohibit major pollution producers from locating in heavily populated areas.

E. 1. a. Because only a small part of Canada is suitable for growing fruit such as peaches and berries, orchard land should be preserved. Good soil is not a factor in industries' choice of location; therefore, industries should be prevented from locating in good soil areas.

b. As harbour facilities are enlarged, a port becomes capable of handling more ship traffic. This brings more business and wealth to the city. However, increased ship traffic adds to air and water pollution.

c. When large woodlots are completely cut down for lumber, no trees are left to reseed the area, and thus no new trees grow to replace those that have been cut down. In addition to losing this valuable resource, the lack of forests creates other problems: trees that previously held back melted snow in the spring are no longer available, and flooding may occur; trees that held the soil in place are gone and soil erosion, caused by wind and rain, is more likely; floods can wash away valuable topsoil; if the water drains off, streams and creeks may dry up and serious droughts may result.

d. For reasons already noted, it is advantageous for industries to locate outside the city. However, they may create pollution and traffic congestion in suburban areas, and, in moving from the city, they take away a source of municipal revenue (taxes), thereby perhaps increasing the tax load on city residents. However, a positive effect of industries' locating in the suburbs is that they offer job opportunities outside the city, and thus reduce the number of commuters and, in turn, reduce traffic congestion in urban centres.

e. A subway system benefits a city by providing a cheap and rapid alternative to private cars, thus reducing traffic congestion and air pollution. Furthermore, because subways are constructed underground, they do not use up the scarce land in the city.

Page 58: GENERAL

A. 1. The glaciers came from the Keewatin Centre, advancing to the west of Hudson Bay, and from the Labrador Centre, moving south.
2. As the glaciers pushed from hardrock into softrock areas, the soil, vegetation and softer rocks were scraped away, leaving an uneven, rocky surface.
3. The numerous lakes in the Shield Region were probably carved out by glaciers.
4. Areas once covered by glacial lakes usually have rich clay soil. St. Félicien, a farming centre bordering Lake St. John, is located on the site of a former Glacial lake.

B. 1. The land that has risen out of the Arctic Ocean consists of low, flat plains; swamps; slow, meandering rivers; and little vegetation.

C. 1. Population is sparse in the southern parts of the Shield because the steep and rocky terrain makes the area unsuitable for farming. Furthermore, roads and railways are difficult and costly to build here.
2. The Shield extends 1,200 miles from Kenora northward to the Arctic Ocean, and 1,400 miles from Lake Athabaska eastward to the tip of Labrador.
3. The part of the Shield that crosses the St. Lawrence River into the United States is named the Frontenac Axis.
   a. It extends into New York.
   b. Minnesota and Wisconsin are the central states into which the Shield extends.
   c. The Thousand Islands are part of the Canadian Shield.
4. Gold, silver, copper, nickel, uranium, zinc and iron ore are found in large quantities in the Shield Region.
5. a. Kenora has a Prairie climate.
   b. Yellowknife has a Continental climate.
6. Permafrost is permanently frozen subsoil. It may begin only a few inches below the land's surface and extend downward 1,000 feet or more.
7. Permafrost is found mostly in the arctic and subarctic sections of the Shield, at varying depths depending on the average summer temperatures. It is found in the areas north of an imaginary line across Canada, beginning at approximately latitude 55° N. at Ungava, moving northward at Churchill to latitude 58° N., and ending on the west coast at approximately latitude 70° N.
8. The early settlers in the Shield who moved west of Hudson Bay came from Great Britain, while those who settled in Quebec came from France.
9. The chief occupations of the early settlers were fur trading, hunting, fishing and trapping.
10. a. Goose Bay is a large military and commercial air base.
    b. Thompson is the centre for the second largest nickel mining area in the world.
    c. Elliot Lake is a centre for uranium mines.
    d. Chibougamau is a copper and gold mining centre.
    e. Schefferville is one of Canada's largest iron mining districts.
    f. Manitouwadge is a mining centre for copper, lead, and zinc.
    g. Noranda is in the centre of a rich copper and gold mining district.
    h. Sault Ste. Marie is an important railway and manufacturing centre. Its canal handles more traffic than any other in the world.
11. a. Churchill–a salt water port for Manitoba.
    b. Steep Rock Lake–an area of large iron deposits supplying the Lakehead.
    c. Sept Îles–a transshipment port for ore from the Quebec-Labrador area.
    d. Sudbury–large deposits of copper and nickel.
    e. Shawinigan–an important centre for power development on the St. Maurice River.
    f. Lake St. John Area–noted for hydroelectric power, aluminium, and pulp and paper.
    g. Fort William-Port Arthur–large grain elevators, an important harbour and railway centre.

Page 60: RIVERS

A. The Coppermine River and Mackenzie River flow into the Arctic Ocean.
The Churchill River and Nelson River flow into Hudson Bay-James Bay.
The Ottawa River and Saguenay River flow into the St. Lawrence-Great Lakes system.
The Eagle River and Romaine River flow into the Atlantic Ocean.

B. 1. A "divide," a high, central ridge, separates the rivers that flow into the Great Lakes-St. Lawrence River system from those that flow into Hudson and James bays. At one end of this divide is the source of the Hamilton River (now called the Churchill River) in Labrador; at the other end is Sault Ste. Marie, on the Great Lakes.
2. The area drained by a river system is called a "drainage basin."

3. The divide extending across the southern part of the Shield separates the Region into two drainage systems, one flowing into Hudson Bay or James Bay, and the other into the St. Lawrence River.
4. High ground, which includes the Franklin Mountains, separates the valley of the Mackenzie River from much of the Mackenzie River lowlands, and therefore prevents the river from flowing into Hudson Bay.
5. Map 41 on page 60, or a more detailed map from another source, may be helpful.
   a. Rivers flowing into Hudson Bay from the west move slowly because they pass through flat lowlands.
   b. Rivers from the south flow slowly over flat land into Hudson Bay, whereas the rivers from the east move more swiftly because of steeper land in that area.
   c. Rivers flowing into the St. Lawrence River from the north move at a fast rate because the south edge of the Shield Region has high elevations, which cause the rivers to drop swiftly to the lowlands of the south.
   d. Rivers flowing into the Atlantic Ocean from the west move swiftly over the steep land that extends almost to the coast.

C. 1. The cold climate of the northern Shield forces animals to grow exceptionally thick coats of fur in order to survive. Fur traders travelled through the unexplored northern part of the Region because the finest fur pelts were found there. They established trading posts deep in the interior so that they would be the first to meet the Indian canoes coming down the rivers with their loads of furs.
2. The early explorers and traders used canoes as their main form of transportation. They were light, portable, and easy to navigate and repair. The rocky terrain of the Shield made road building extremely difficult, whereas the rivers provided ready-made travel routes.
3. Travelling from Port Nelson to Winnipeg, one goes up the Nelson River past Split Lake, through the chain of Sipiwesk Lake, Cross Lake and Playgreen Lake, to the south end of Lake Winnipeg, and up the Red River to Winnipeg.
4. Water is the cheapest and easiest method of transportation to this part of the Region. However, ship travel is severely limited because Hudson Bay is closed by ice during all but the late summer months.
5. The rocky, uneven surface of the Shield, with its many lakes, rivers, and swamps, made it difficult and costly to build railways and roads. Trees had to be cut down, rocks blasted out, and swamps drained. As a result, few roads and railways were built.
   a. Because of its rugged, inhospitable terrain, the Region did not lend itself to farming, and settlers were not attracted there. Furthermore, the lack of roads and railways made most of the Region nearly inaccessible. Only after the natural resources of the area were developed did settlers begin to arrive in appreciable numbers.
   b. Although there are still few roads and railways in the Canadian Shield, airplanes have greatly influenced the development and settlement of this Region. Large transport planes now fly people and supplies to places that were formerly inaccessible.

D. 1. Between one-third and one-half of the Canadian Shield is covered with forest. Much of the wood is not suitable for lumber; most of it is used for pulpwood.
2. One of the main uses of timber today is in the manufacture of wood pulp.
3. Valuable mineral deposits are found in the Shield, and water for hydroelectric power is available. The area also provides an excellent year-round vacation land.
4. The southern part of the Shield was explored mainly by the French, and the nothern part mainly by the British.

Page 62: HYDROELECTRIC POWER

A. 1. The many natural lakes and rock basins that were formed by glacial activity provide excellent storage basins which result in even run-off. The relief causes rapidly flowing rivers and results in the water falling with great force.
2. The eastern part of the Shield is rocky and uneven. Rivers here flow faster than they do elsewhere in the Region because their descent to sea level is more abrupt. By harnessing the rapid flow, dams and power installations can be built. In addition, the eastern part of the Shield is close to the power demands of the densely populated regions to the south. The western part of the Shield is comparatively flat; many of the rivers have to cross the Hudson Bay lowlands where they become wide, meandering, slow-moving streams, unsuitable as sources for hydroelectric power.

B. 1. Most of the precipitation falls during the summer months, reducing chances of drought and ensuring a constant supply of water throughout the year.
2. To operate efficiently and economically, a power plant requires a continuous, even flow of water.

3. a. Most of the snow and ice that collects in the forests during the winter is sheltered from warm winds and sun by trees. Run-off in the spring is gradual, with little risk of floods.
   b. The roots of trees hold the soil in place. Trees also act as a windbreak, preventing the earth from being carried away by winds.
4. The chief manufacturing industries of the Shield are pulp and paper making, and metal smelting and refining.
5. a. Sudbury obtains its power from the Abitibi River.
   b. Sault Ste. Marie gets power from the St. Mary's River.
   c. The Lakehead gets power from the Nipigon River.
   d. Timmins gets power from the Abitibi River.

C. The Fort William area lacks the relief (the drop in land levels) that allows water to fall rapidly.

D. 1. Quebec produces about half of Canada's water power chiefly because of the nature of its relief.
2. River systems supplying the following areas with power are:
   a. Montreal—the Ottawa River and the St. Lawrence River.
   b. Eastern Townships—the St. Maurice River and the Chaudière River.
   c. Quebec City—the Saguenay River.
3. Many cities in southern Quebec are situated on rivers (such as the St. Lawrence, Ottawa, Saguenay, and St. Maurice rivers) which are sources of hydroelectric power. Cities in southern Ontario have few rivers with comparable power potential.
4. Because the northwestern part of the Shield has not been greatly developed economically, and because settlement there is relatively sparse, the area does not require a great deal of electric power.
5. In each case, the abundant supply of hydroelectric power helps keep production costs down, which results in lower prices for the consumer.
6. The elevations shown on the Profile are typical of the rocky, uneven terrain of the Canadian Shield Region.

Page 64: MINING

A. 1. It is suggested that the students obtain this material as a research project.
2. a. Gold is used in coins, jewelry, and dentistry.
   b. Silver is used in coins, silverware, jewelry, ornaments, and in the chemical industry.
   c. Copper is used as an electrical conductor, in the making of brass and bronze, and for pipes.
   d. Nickel is used in electro-plating, in coins, and in chemical and food-processing plants.
   e. Uranium is used as a fuel for power plants and in atomic and hydrogen bombs.
   f. Iron Ore is used in the making of steel, tools, and machinery.
3. a. See discussion of part "B" on page 37 in the textbook.
   b. Open-pit mining is practical only where the rock containing the ore is on, or close to the surface. In the Shield, ore-bearing rocks are frequently near the surface because in many places glaciation has cleared away the material that caused these deposits.
   c. Two large open-pit mines in the Shield are: the Steep Rock iron mine near Atikokan, Ontario, and the Iron Ore Company of Canada mine in Schefferville, Quebec.

B. 1. a. Location: The proximity of a mining area to centres of population and to transportation facilities is important to access to a labour force, and to a means of transporting equipment to the mines and the minerals from the mines.
   b. Geology: A knowledge of the geology of an area is essential in order to determine the extent of the mineral deposit and the problems involved in extracting it.
   c. Water supply: Mining operations require a great deal of water; access to water is therefore important.
   d. Power supply: Electrical power is necessary for lighting and to operate machinery.
   e. Market: Markets must be close enough so that shipping costs are not prohibitive.
   f. Climate: In order for mining to be profitable, the climate must be temperate enough to allow mining operations to take place most of the year.
   g. Timber: A local supply of timber is important when mines are built underground, and wood is used to build shafts and tunnels. Timber is also used for fuel and hydropoles.
   h. Labour supply: Without nearby towns, it might be difficult and costly to bring in an experienced labour force.
   i. Food supply: If food must be brought in from a great distance, operating costs will be increased.
2. Because there are more and better roads and railways in northern Ontario than in northern Quebec, finding mineral deposits and operating mines has been facilitated in Ontario.

3. The land along the St. Lawrence estuary is relatively flat, whereas the land through the Shield is rocky and mountainous (in northern Quebec) and therefore impractical for railway construction.
4. Most mining towns grew up in isolated regions where mining was the sole industry. When the mines closed because of poor profits, the townspeople had to move elsewhere for work.
5. Ore from Schefferville is transported by train to Sept Îles, a port on the north shore of the St. Lawrence estuary. From there the ore is loaded onto lake freighters (transshipped) and carried up the St. Lawrence River through a series of locks to Lake Ontario and Hamilton.

Notes on Photographs

Ore Train: The cars are enclosed in order to prevent the ore from freezing into a solid block, making it difficult to remove.

Open-pit Mining: The terraces provide roadways for trucks which remove the ore. They also are a catch area for falling debris.

Copper Cliff

1. The main smelting plant is in the upper right corner of the photograph, partially obscured by smoke. On the map, it is the group of buildings just above the centre.
2. The large smelting plant at Copper Cliff requires a good transportation system to bring in ore and ship out the refined metals.
3. Slag is a waste by-product of smelting or refining operations. It is molten material containing impurities and other waste matter that has been separated from the mineral in the furnace. Tailings is the rejected part of the ore, which is washed away from the mineral by water after the ore has been crushed. Slag and tailings are found mainly in the open area between the smelting plant and Sudbury. A large tailings area almost surrounds the lake in the upper middle of the photograph.
4. a. Sulphur fumes, a product of the smelting process, have killed or damaged most of the vegetation in this area. Furthermore, the slag and tailings will probably be washed by rain into the surrounding lakes, polluting them, and destroying fish, animals, and birds that live on fish. Several dams can be seen on Map 43 along the lakes. Dams too can disturb animal and plant life in the area.
   b. In 1965, the 175-foot smokestack of Falconbridge Mines Limited was replaced by a 450-foot stack. This new structure disperses fumes farther away, reducing air pollution.
5. The many contours shown on the map and their haphazard arrangement suggest the irregular, rocky surface that is typical of the Shield Region. The numerous lakes and rivers are also evident.
6. Highway 544 can be seen at the top of the map running southeast along level ground and then between two large hills. The road was built to follow the contours of the land, in order to avoid the expense and difficulty of building across or through the hills.

Page 68: THE LAKE ST. JOHN AND SAGUENAY RIVER AREA

A. 1. Lake St. John is to the left of the centre of the map; the Saguenay River extends through the centre of the map to the right.
   a. Lake St. John is north of Quebec City.
   b. St. Félicien is 132 miles by air from Quebec City.
   c. The Saguenay River flows into the St. Lawrence River at Tadoussac.

B. 1. Rapids upstream from Port Alfred prevent large ships from sailing directly to important centres.
   2. High, rugged, wooded hills surround the flat river valley.
   3. Because the frost-free period lasts about 7 months, the rivers in the St. Félicien area can be used for transporting logs.

C. 1. The area surrounding Lake St. John was once part of a much larger glacial lake. The rich clay is part of the old lake bottom.
   2. The Lake St. John area has a comparatively long frost-free period, and hills shelter the area from severe winds.

D. Most of the crops of the Lake St. John–Saguenay River area are consumed locally, although some are shipped north to the mining community of Chibougamau.

E. 1. The Lake St. John area is so isolated from other settled areas that it is not profitable to ship its perishable produce over long distances.
   2. During the winter months the farmers can work in the lumbering industry.
   3. The chief centres for pulp mills in this area are Mistassini, Alma, Chicoutimi, Kenogami, and Port Alfred.

4. Pulp and paper mills need electric power to run their machinery. Without cheap electricity, these mills could not be operated profitably.
   The vast forests in the Shield make the pulp and paper industry possible.

F. 1. Spruce, balsam and hemlock thrive on the soils of the Shield.
   2. During the winter months, trees are cut, logs are dragged to the rivers or trucked to the mills, and in some areas, timber roads are built.

G. 1. Aluminium is used in pots and pans, door and window frames, wall sidings, radio and television parts, house and garden tools, awnings, clothes dryers, and heating equipment.
   2. Aluminium is strong yet malleable, extremely light, does not rust, readily transmits heat, and is a good conductor of electricity.

H. Arvida was established as the site for an aluminium smelter because it is near a huge power plant on the Shipshaw River, a tributary of the Saguenay River, which produces vast quantities of electricity.

I. Most of the bauxite used at Arvida comes from Guyana and Jamaica. No bauxite is mined in Canada.

J. Synthetic cryolite is imported from Europe; fluorspar is mined in Newfoundland.

K. 1. It is more economical to transport the ore by water than by road or rail, but during the winter the Saguenay River is frozen over and closed to navigation.
   2. Railways and trucks are used during the winter months to export from Arvida.
   3. a. Because Arvida is considered one of Canada's best planned communities, it has been able to attract and maintain a good labour force.
      b. Arvida is near a cheap source of water power.
      c. Arvida is situated on an excellent water transportation system, and it has good road, rail, and air connections with Quebec City and other important centres.
      d. The excellent farming country around Arvida supplies plenty of fresh produce which keeps food costs down.
   4. a. Waterpower is most important because an aluminium smelter cannot be operated profitably unless a supply of cheap water power is available.
      b. Transportation is very important because almost everything used in the smelting of aluminium must be imported and the aluminium itself must be exported.
      c. A labour force is essential but it can easily be brought in if good living conditions are available.
      d. A farming area close by is a great convenience, but food can always be imported.

Page 70: FOREST PRODUCTS

A. 1. A board foot is the volume of a piece of wood 1 inch thick and 1 foot square, and is a term associated with the lumber industry.
   2. A pulp mill mashes wood fibre into pulp; a paper mill manufactures paper from wood pulp.
   3. The soil in the forested areas can absorb sufficient water for the growth of trees; adequate rainfall and warm temperatures are also responsible for the extensive forests.
   4. A severe climate and the lack of transportation routes make logging operations difficult and unprofitable north of the 55th parallel.

B. 1. The short growing season and limited amount of precipitation restrict the growth of trees in the north.
   2. Pulp and paper mills are always located near lakes or rivers because: water power is needed to operate the mills; rivers and lakes are used to transport the logs to the mills; a great deal of water is used in manufacturing pulp and paper.
   3. a. taiga: a region of coniferous trees. The taiga stretches across the northern part of Canada.
      b. "land of little sticks": the northern part of the taiga where the trees gradually diminish in size until they cease completely at the tree-line. Trees in this area are of no value commercially.
      c. tree-line: also called the timberline—the line at which temperatures become too cold for trees to grow. Beyond the tree-line, the average temperature of the warmest month does not exceed 50° F.
      d. tundra: the area north of the tree-line where temperatures are too cold for the growth of trees. Only grass, herbs, mosses and lichens are found here.
      e. deciduous trees: trees that shed their leaves in the fall of each year, such as the maple, oak, poplar and birch.
      f. coniferous trees: evergreen trees that do not shed their foliage annually, such as the pine, spruce, cedar and fir.

C. 1. Most of the rivers in the Shield are too narrow, twisting, and shallow, or have too many falls and rapids to be suitable for transporting logs. Furthermore, many rivers in the Shield flow north or northeast, away from the sawmills, pulp and paper mills, and manufacturing centres where they are needed.

2. a. Rivers are the cheapest and most convenient method for transporting logs to the mill. Rivers also supply power for hydroelectric plants.
   b. In the photograph the logs are moving north.
   c. Three piles of pulpwood are shown.
   d. The finished product is transported to market by train.
   e. It is likely that this mill produces large quantities of paper because: the mill is large; a great many logs are floating in the river; the piles of pulpwood stacked beside the mill and the large parking lot indicate a large labour force.
3. Four important requirements in choosing a site for a pulp mill are: access to good timber, means of transporting the logs to the mill, power sources to operate the mill, and transportation facilities to carry wood pulp to markets.
4. Spruce, jackpine, balsam, cedar, poplar and hemlock are used in making pulp and paper.
5. Cutting is done during the winter; it is possible to ship the logs over the frozen land on temporary roads, and underbrush and insects are less of a problem than during the summer.
   The trees are usually cut by gas-powered chain saws.
6. Logs are moved from the forest to the mills in the spring. During the winter, the logs are hauled by horse or tractor to the bank of a river where they are piled to await the spring. As soon as the ice melts, the logs are dumped into the water, and the spring drive begins. The drivers work along the banks of the river with long, spiked poles to prevent the logs from being stranded on the shore or in backwaters. The drivers must also prevent the logs from being caught on rocks or becoming entangled with each other and thus forming a logjam that would block the whole drive. When the logs reach a lake where there is no current, they are collected together to form what is known as a boom. Then they are towed to the mill by small tugs.
7. Overcropping refers to cutting trees at a faster rate than they can be replaced by the growth of new trees.
8. To insure a steady supply of pulpwood, mill operators cut only part of their holdings each year, and they replant the cut areas.

D. 1. Newsprint is the paper on which newspapers are printed.
   2. The major importer of Canada's newsprint is the United States.

E. Extensive advertising campaigns are being carried on to educate the public to the need for extreme care in forests. Lookout towers and specialized fire-fighting equipment are maintained in all major forest areas, and trained forest rangers patrol the forests and enforce fire prevention regulations. Laws have been passed prohibiting campfires in forests during periods of drought. Attempts are being made to develop trees that will be more resistant to insects and diseases.

Page 73: RECREATION

A. 1. Tourism is an important industry in the Shield Region.
   2. a. The top picture suggests the Muskoka Lakes, one of Ontario's most popular vacation areas (although it might have been taken in other parts of the province).
      b. The lower left-hand picture probably was taken in the southern part of the Shield because both evergreen and deciduous trees are shown.
      c. The lower middle picture suggests the province of Quebec where the Laurentian Hills, north of the St. Lawrence River, have always been popular with skiers.
      d. The lower right-hand picture might have been taken in many parts of the Shield, but probably not very far north because mosquitoes and blackflies in the north would not allow the fisherman to roll up his sleeves.
   3. Both evergreens and deciduous trees, the types shown in the picture, grow in the southern part of the Shield. This area is popular during the summer with tourists from the United States because its climate is cool and pleasant, and the Region has unlimited facilities for swimming, boating, fishing, and exploring.
   4. a. The distance from New York to North Bay is 670 miles.
      b. The distance from Detroit to North Bay is 450 miles.
   5. Summer in the Shield is cooler and less humid than in Florida.
   6. The colour of the grass and scrub growth in the forest indicates that it is fall, and the men are hunting moose, which is legal only during the fall.
   7. Deer, moose, and bears inhabit the Shield.
   8. Small game hunted in the Shield include rabbits, groundhogs, raccoons and foxes.

B. 1. Wild ducks and geese are waterfowl that inhabit the Shield.
   2. The government protects wild animals by restricting hunting to certain periods of the year, and by limiting the number of animals and birds that can be killed by one hunter.

C. 1. The hills shown are higher than those found in most parts of the Shield, and Quebec is noted for its skiing.
2. The part of the Shield just north of Montreal is called the Laurentian Hills or the Laurentian Highlands.
3. The evergreen spruce is the most common tree in this area; however, deciduous trees–maples, poplars and birch–are also found.
4. The photograph gives an indication of the rocky terrain of the Shield, its thick evergreen forests, its many lakes, and narrow rapid streams.

D. 1. Trout, bass and pickerel are species of game fish found in the Shield.
2. Tourists provide income for residents of the resort areas by hiring local guides, buying supplies and camping equipment locally, renting living accomodations, frequenting restaurants, and using recreation facilities.
3. a. Tourists might be encouraged to return if they were given hospitable and friendly treatment by local residents.
b. By their enthusiastic reports to their friends, tourists might convince others to visit the area.

Page 74: HUDSON BAY–JAMES BAY LOWLANDS

A. 1. The combined use of Maps 40, 41, and 42 will provide most of this information.
2. a. Scientists believe that this Region has only recently risen, geologically speaking, from beneath the waters of Hudson Bay and James Bay. This uplift has been gradual–about an inch per century, so that the land is not far above sea level. Because the land is low and flat, it is poorly drained.
b. Settlements were established here mainly as trading posts. They had to be located near a cheap and readily available means of transportation; in this area, the means was water.
c. The land is low, and its resulting poor drainage creates soft, spongy surfaces. Sand and gravel, needed to build a firm roadbed, are difficult to obtain. The danger of roads being washed out or sinking below the surface is always present, and heavy winter frosts add to the difficulties of maintaining good roads.
d. Although the Lowlands are flat, the Canadian Shield to the south and west of this region descends in the direction of James Bay and Hudson Bay. The rivers flow sluggishly across the Lowlands and eventually drain into the ocean.
3. It is suggested that students gather this material as an outside research project.
4. a. The annual rainfall at Fort Severn is 20-30 inches.
b. The average July temperature at Churchill is 50-55° F.
c. The average January temperature at Moosonee is 5-10° F.
d. The average length of the frost-free period for this area is 60-80 days.
5. The inhabitants make their living by hunting, trapping, fishing, and from the tourist trade.
6. The early inhabitants of the area were Indians and Eskimos.

B. 1. Other early settlers on these shores were British.
2. Permafrost is found throughout this Region except for a small area in the southern part of the Yukon and in the Great Slave Lake area.
3. The chief vegetation in the tundra is lichen, grass, herbs and mosses.
4. Moosonee is at latitude 51° North; Churchill is at latitude 59° North. The distance from Toronto to Moosonee is 550 miles, and from Toronto to Churchill it is 1,200 miles.

Chapter 4 THE APPALACHIAN REGION

Page 76: APPALACHIAN REGION

A. 1. The Appalachians extend northeast from the southern United States.
2. The coastal area is rocky, hilly and barren.
3. The original settlers of this area were primarily fishermen.
4. a. The Eastern Townships of Quebec were settled by the British.
b. The Gaspé Peninsula was settled by the French.
c. The Atlantic Provinces were settled by the British.

B. 1. In the Gaspé Peninsula and the Atlantic Provinces, the major industry is fishing; therefore, the settlements are near the coast. The inland areas are mountainous and heavily wooded, cut off from the coast by a lack of transportation. The land in the Eastern Townships is well-suited to agriculture, lumbering and mining; hence, settlement is more evenly distributed in that area.
2. Roads are costly to build in this area because the land is mountainous, rocky and heavily wooded.
3. The Eastern Townships and the Gaspé Peninsula belong to the province of Quebec.
4. a. The chief crop of the long narrow farms is—hay for dairy cows. (Gaspé area)
b. Maple trees are—tapped for syrup in the spring. (Eastern Townships)
c. Sawmills, flour mills, and textile mills were—developed on sites where waterpower was available. (Gaspé area and Eastern Townships)
d. Herring, lobster, and salmon are—sold fresh in cities of southern Quebec. (Gaspé area)
e. Canada's second largest deposit of copper is—mined at Murdochville. (Gaspé area)
f. Most of the world's supply of asbestos is—mined near Thetford Mines. (Eastern Townships)
g. Seasonal sports help—to encourage a large tourist industry. (Gaspé area)

Page 77: EASTERN TOWNSHIPS

1. a. Granby is about 45 miles from Montreal.
b. The land in this area is rugged, with rocky hills, and many lakes and rivers.
2. French is the main language in the Eastern Townships.
3. a. Maple syrup is an important product of this area.
b. The syrup is collected in the early spring.
4. Because Sherbrooke has a frost-free period of about 110 days, a relatively cool summer, and an adequate amount of precipitation, hay is one of the few crops that can be grown successfully in this area.
5. Quebec is Canada's leading producer of butter and milk, and the Eastern Townships supply a large part.
6. Sheep and dairy cattle are important sources of income in this area.

Page 78: ATLANTIC PROVINCES

A. 1. The coastline is rough, jagged and irregular, exactly the opposite of what it would be like were it just emerging.
2. a. The St. Lawrence River extended to the Saguenay River.
b. Anticosti and Newfoundland were each peninsulas; Prince Edward Island and Cape Breton Island were each part of a large land mass.
c. The Strait of Belle Isle was part of the mainland; Northumberland Strait and the Bay of Fundy were part of large land masses; the St. Lawrence River was much shorter and narrower than it is today.
3. If the land sinks another 500 feet, much of the area will be covered by water; the shoreline will have many bays and inlets, and numerous islands will dot the coast. Such a change would result in Prince Edward Island going under water; Nova Scotia would become a group of islands; and the St. Lawrence River would widen to Quebec City and then become a large inland lake, swallowing up Lake Ontario.
4. The St. Lawrence River of the future will be similar to that of the past in direction of flow, and it will continue to provide an outlet for the Great Lakes.
5. People in the Atlantic Provinces see daylight before people on the Prairies because the earth rotates in an eastward direction, and the sun rises in the east.
a. When it is 9:00 a.m. in Halifax, it is 6:00 a.m. in Edmonton.
b. When it is 5:00 p.m. in Vancouver, it is 9:30 p.m. in St. John's.

B. 1. See Map 46.
2. Cape Chidley is at latitude 60° N. and longitude 65° W.; Cape Sable is at latitude 43° N. and longitude 66° W.; St. John's is at latitude 47° N. and longitude 52° W.
3. a. Cape Chidley to Cape Sable is 1,150 air miles.
b. Cape Sable to St. John's is 700 air miles.
c. St. John's to Cape Chidley is 1,000 air miles.

4. The north-south extent of the Atlantic Provinces is 1,140 miles, slightly less than the north-south extent of Quebec, which is 1,187 miles.
5. The east-west extent of the Atlantic Provinces is 775 miles, slightly greater than the east-west extent of northern Ontario, which is 770 miles.
6. Water occupies most of the triangle that lies between latitude 45° N. and latitude 50° N.

Page 79:BARRIERS

1. A ship sailing from St. John's to Montreal would enter from the Atlantic Ocean, go through Cabot Strait, the Gulf of St. Lawrence, and up the St. Lawrence River.
   a. The distance along this route is 1,000 miles.
   b. At an average speed of 20 miles an hour, the voyage would take 50 hours.
2. The shortest truck route from Halifax to Toronto would be through Truro, Moncton, Fredericton, Rivière du Loup and Montreal.
   a. The distance is 1,150 miles.
   b. This great distance raises the price of goods manufactured in Toronto but marketed in Halifax.
3. The most direct route to central Canada goes through the Appalachians. The roads in this area are steep with many curves, making transportation slow, dangerous and expensive.
4. Maine lies west of New Brunswick. In traveling through Maine to get to the rest of Canada, the border must be crossed twice, and, the roads through the area are poor.
5. a. Prince Edward Island is Canada's smallest province.
   b. Nova Scotia includes the mainland, which is a peninsula, and Cape Breton Island.
   c. Newfoundland is Canada's largest Atlantic province.
   d. New Brunswick is the westernmost of the Atlantic provinces.
   e. The elevation of all of Prince Edward Island is under 500 feet.
   f. Newfoundland's highlands run from the Strait of Belle Isle to Port aux Basques.
6. Open answer. The following are suggestions:
   a. Why do tides in the Bay of Fundy rise so high? What is the origin of the name "Fundy"?
   b. Why did Labrador remain undeveloped for so long a period of time?
   c. Why isn't more iron and steel used for manufacturing in Nova Scotia? Why has Nova Scotia's population grown so slowly?
   d. What are the most important requirements for a good harbour? Why is Halifax a more important harbour than Saint John?
   e. Where in the Atlantic Provinces would you be farthest away from the Pacific Ocean? What large cities in the United States are almost the same distances from Halifax as Quebec City and Ottawa (in a direct line)? What is the distance between Halifax and the major seaports in Western Europe?
7. Open answer.

Notes on Photograph
The port city in the photograph is Halifax.

Page 80:CLIMATE

A. 1. The highest winter temperatures are found along the south coasts of Newfoundland and Nova Scotia because these areas lie in the path of the warm Gulf Stream.
   a. The average January temperature is 25° F.
   b. The ocean has a warming effect on nearby land.
2. St. John's is on the coast; Fredericton is located inland.
3. The higher the altitude, the lower the temperature. For example, the southwest coast of Newfoundland is warmer than the mountainous area to the east, although both are located at about the same latitude.
4. The average January temperature at Halifax is 25° F.
   a. Open answer.
   b. The harbours of Maritime shipping ports are on the sea. Sea water freezes at temperatures well below 32° F. because of its salt content.
5. During the summer, the ocean has a cooling effect on land along the coasts.
6. As one goes inland from the sea, temperatures become higher during the summer and lower during the winter, because the moderating influence of the ocean does not affect inland areas.
7. The highlands, as the name implies, are of a higher altitude, causing temperatures to be lower in both summer and winter.

8. During the winter, the highest temperatures in the Region occur in lowland areas by the sea. During the summer, they occur in the interior lowlands. (Factors influencing these temperatures are discussed in Questions 1-7.)
9. The average July temperature at Halifax is 65° F.
   a. Open answer.
   b. The temperature range at Halifax is about 40 degrees.

B. 1. The southeast coasts of Nova Scotia and Newfoundland receive the most precipitation because: warm, moisture-laden air accompanying the Gulf Stream meets the cold air over the Labrador Current, which comes down from the Arctic Ocean; the cold air causes the warm air to rise, condense, and form rain.
2. As one moves inland from the south coast, the amount of precipitation decreases.
3. a. The plentiful rainfall produces abundant crops.
   b. Heavy rains keep rivers flowing, which is important for the transportation of logs. They increase forest growth, and help prevent forest fires.
   c. Heavy rains increase the flow of rivers, thereby providing sources for hydroelectric power.
4. a. Farming is affected by: the nature of the land surface, the quality of the soil, the climate (temperature and precipitation), the length of the growing season, and the proximity to markets.
   b. Forest industries require access to the forests, a means of transporting the logs, and electric power to run the mills. Tree diseases, insects, and fires also are factors influencing the success of the industry.
   c. Hydroelectric development requires access to sites for dams and power plants, and a constant, even flow of water throughout the year.
5. Open answer.
6. The length of the growing season increases in:
   a. areas located at southern latitudes.
   b. areas near large bodies of water.
   c. areas of low altitudes.
7. The least snow would be found along the southern coasts of Nova Scotia and Newfoundland because these areas have the highest winter temperatures, and therefore most of their precipitation is in the form of rain.

C. 1. The east coast of the Avalon Peninsula has a short growing season because it is in the path of the cold Labrador Current that flows down from the Arctic Ocean.
2. The Annapolis Valley has a growing season of 180-200 days.
   a. The Niagara Peninsula has a growing season of 200-220 days.
   b. The St. Lawrence Lowlands has a growing season of 180-200 days.
   c. The Lake St. John area has a growing season of 160-180 days.
3. The Gulf Stream and the Labrador Current affect the climate of the Atlantic Provinces. When these two currents meet, the warm air over the Gulf Stream rises and cools off very quickly because of the cold air over the Labrador Current. This causes condensation just above the surface of the water, resulting in fog.

Page 82:PEOPLE

A. 1. The Atlantic Provinces belong to the Appalachian Region. The land in this Region consists of: rocky, well-wooded highlands; wide, fertile river valleys surrounded by gently rolling hills; a rocky jagged coastline.
2. Prince Edward Island has the most even population distribution because its land is uniformly low, good for farming, and accessible.
3. The irregular coast includes many small bays and coves which provide excellent harbours for small fishing villages.
4. The early settlers in Nova Scotia looked to the sea for their livelihood. This is still true today, except for those who farm in the fertile valleys. The interior is rocky and generally unsuitable for settlement.
5. Some activities found in the interior include: lumbering, mining, and the production of hydroelectric power.

B. 1. Fishing and its allied industries–curing, processing, and canning–attract people to the coast.
2. The river valleys offer good land for farming.
3. The Saint John river valley has the largest population.
4. The interiors of Newfoundland, Nova Scotia and New Brunswick contain few people because the land is rocky and heavily forested, making it unsuitable for farming and costly for road building.
5. The three largest cities in the Atlantic Provinces are Halifax (Nova Scotia), St. John's (Newfoundland), and Saint John (New Brunswick).

C. Fishing and fish drying are carried on along the coasts. Salt mining is carried on at Pugwash, Nova Scotia, and on the south shore of the Northumberland Strait. Sawmills are operated at Newcastle at the mouth of the Miramachi River. Farming is carried on in river valleys throughout the area.

D. 1. The distance from the highlands where the rivers begin to where they empty into the ocean is short.
2. There is abundant precipitation throughout the year. Swamps and small lakes in the well-wooded highlands provide a reservoir for melted snow and ice and prevent both fast run-off in the spring and a lack of water during the summer.
3. These rivers are used as sources of hydroelectric power.
4. Factors a pioneer might consider in choosing a place for settlement include: a source of fresh water for drinking, a site near water for fishing, a site near a forest to provide both game for food and lumber for building material, level land on which to build, fertile land and a moderate climate suitable for agriculture.

Page 84:FISHING

A. 1. The interior of this area was rocky, heavily forested, and thus not well-suited to agriculture. But the coastal region provided safe harbours and the waters off the coast were filled with fish.
2. In the early days, ships were built almost entirely of wood. The long, slim trees were excellent for masts.
a. Today almost all ships are built of steel or other metals.
b. Lunenburg, Nova Scotia is known for its shipbuilding. The Bluenose was built there; in 1921, this schooner won the sailing championship of the North Atlantic fishing fleet and eventually retired undefeated in this contest.
The first settlers of Lunenburg came from Germany.

B. 1. Scientists believe that the Continental Shelf was once dry land that gradually sank under the sea to its present depth.
a. The depth of the shelf averages 100 fathoms, or 600 feet.
b. The average depth to the ocean floor beyond the shelf is 1,000 fathoms or 6,000 feet.

C. 1. Because the sea above the Continental Shelf is only a few hundred feet deep, sunlight can reach it and stimulate the plant growth.
a. Plankton is the minute animal and plant life floating just off the sea floor; it provides food for fish.
b. The cold water of the Labrador Current mixed with the warm water of the Gulf Stream results in moderate water temperatures.

D. Plankton does not grow well north of Newfoundland, because the water is too cold; south of Boston, the water is too warm.

E. 1.

TOPIC	INSHORE FISHING	OFFSHORE FISHING
Distance from Shore	12 - 15 miles	200 - 500 miles
Type of Boat	small, 3- to 4- horsepower motorboat; longliners	schooners (with dories) trawlers draggers
Number in Crew	1 or 2 men; 6 on longliner	20 or more
Type of Fish Caught	lobster herring cod sardines	cod salmon halibut haddock mackerel
Method of Catching Fish	lines baited hooks nets	gill nets purse seines otter trawls
Weight of Catch	up to 10 tons on longliner	up to 1,000 tons

2. It is suggested that students do outside research to gather this material.
3. a. Lobster fishing is not full-time work. It can easily be combined with agricultural pursuits.
   b. Lobsters are caught in traps made of laths and wire netting. Bait is placed inside the trap; lobsters enter and cannot get out.

F. 1. Pictou is the center of the lobster industry.
2. Gill nets, otter trawls and purse seines are used in netting fish.
3. a. A gill net looks something like a tennis net. It is towed behind a boat. When the fish swim against it, their gills catch in the meshes of the net, and they can neither swim through the mesh nor back out. One edge is kept on the surface by means of floats and the other edge is kept down in the water by sinkers.
   b. An otter trawl is a cone-shaped net. It is dragged along the ocean floor with its mouth kept open by means of weights, floats, and boards.
   c. A purse seine is much the same as an otter trawl, but it is towed by boats to form a circle. The bottom edge is then gathered together by means of a rope which acts as a drawstring.
4. The largest fish cannery in the Atlantic Provinces is at Blacks Harbour in New Brunswick.

G. 1. Many fishing vessels are now equipped with their own refrigeration plants.
2. If ships returned daily with their catch, they would lose valuable fishing time going to and from the fishing grounds.
3. Large schools of fish are located by electronic fish-finders which operate by sound waves. When these waves are sent out, they bounce off fish schools and return to the vessel, revealing where the fish are, how many there are, how fast and in what direction they are moving, and frequently even the species of fish.
4. It is suggested that students do outside research to gather this material.

H. Fish are cured (dried and salted), frozen, canned, and they are combined with other commodities to make food products or to be reduced into fertilizers.

I. 1. Fishing fleets from France, Norway, Portugal, Great Britain, the United States and the Soviet Union fish off Canada's east coast.
2. These countries would not be major importers of Canada's fish.

J. 1. Some ships are now built large enough to carry refrigeration and processing equipment so that fish can be cleaned, filleted and frozen at sea.

K. 1. British Columbia landed the greatest weight of fish, with Newfoundland second, and Nova Scotia third.
2. Much of Newfoundland's catch is cod, which does not bring as high prices as British Columbia's salmon or Nova Scotia's lobster and sardines. In addition, Newfoundland has comparatively few fish-processing plants, and its dried, salted cod does not command as high a price as filleted or canned products.
3. a. The fishing bank would be the Grand Banks.
   b. The ship is 675 miles from Halifax and 225 miles from St. John's.
   c. At 25 miles an hour, it would take a rescue boat 9 hours.

Page 87: FOREST RESOURCES

A. 1. Conifers—spruce, pine, cedar, and fir, and some deciduous trees—maple, birch, ash and tamarack, are common in the Acadian Forest.
2. Forests in the Atlantic Provinces are found in Nova Scotia and New Brunswick.
3. Because the land in Prince Edward Island is flat and the soil fairly fertile, almost all the land has been cleared for farming.
4. Newfoundland's forests consist mainly of conifers.
5. Plentiful rainfall, moderate temperatures, and a sufficiently long growing season favor intensive forest growth.

B. 1. Too much rainfall washes away fertile soil in the summer, and in winter freezes and kills the roots of the trees.
2. Wind and water cause soil erosion.

C. 1. Logs are floated down rivers, or, if no suitable river is available, they are transported by truck or train.
2. Most rivers in this area are too small, too rapid, or too twisting to be suitable for floating logs.
3. There are few roads into the interior of New Brunswick and Newfoundland, making it difficult to reach good logging areas and even more difficult to get the timber to mills.
4. The rocky, uneven land surface of these areas hampers the building of roads and railways.
5. Mills at the mouths of rivers can load their products directly onto ships, and there is usually open water available for "storing" logs until they are needed at the mill.

D. 1. New Brunswick gets 10.5 percent of its income from forest industries; Newfoundland, 7.8 percent, and Nova Scotia, 2.9 percent.

2. The world's largest newsprint mill is located at Corner Brook in Newfoundland, which has a moderate climate.
3. Newsprint is exported mainly to Great Britain and the United States.

E. 1. Tall straight pine trees were used for masts and spars.
2. Modern ships are built almost entirely of steel. Lumber is used in shipbuilding today mainly in making small boats and pleasure craft.
3. Most of the timber in these areas is cut by power saws and other power tools.

Page 88:MINING

A.1-4. Students can refer to maps in this chapter in order to draw their own map of the Atlantic Provinces. The other information may be obtained through outside research.
5. Coal is an important raw material for making iron and steel. Its weight and bulk make it costly to transport. Therefore, iron and steel plants would tend to be located near sources of coal.
6. Iron ore—for pig iron and steelmaking.
Coal—for fuel and steelmaking.
Zinc—for galvanizing, manufacturing of brass products, and when rolled into sheets, as a protective covering for roofs.
Lead—in storage batteries and cable coverings.
Gypsum—in plasters and wallboards.

B. 1. Most of the Atlantic Provinces' coal is mined in the Glace Bay-Sydney area in Nova Scotia. Coal fields are also found near Pictou, Stellarton, Springhill and Joggins in Nova Scotia, and Minto in New Brunswick.
2. Mines at Glacy Bay run out under the sea. The miners have to travel two or three miles from the shaft to get to their working place.
3. A coal mine is also called a colliery.
Dangers in mine tunnels include fire, gas poisoning, explosions, flooding (by water seeping in), and cave-ins. The poor lighting and undesirable air may also harm the miners' eyesight and lungs.
4. Layers of coal are called seams.
5. Nova Scotia mines approximately 4 million tons of coal annually.
6. Miners wear hard hats for protection against falling rocks and other debris. In addition, lamps are mounted on the hats for use if the lighting system fails.

C. 1. The foreman supervises the whole operation; the two operators run the machine; the three timbermen shore up the roof and walls of the working area with pit props and mine timbers to prevent cave-ins; the mechanic is responsible for maintenance and repair of machinery.
2. Coal is brought to the surface by small railways.
3. Sydney is a good location for a steel plant because it is an important seaport and can supply shipping facilities.
4. The iron ore used in this plant comes from Wabana in Newfoundland.
5. Sydney's electricity comes from a thermal electric power plant, which uses coal for fuel.
6. Coal mining has diminished in importance because mining costs have increased, and because of severe competition from oil and gas, which are cleaner fuels.

Page 90:FARMING

A. 1. Prince Edward Island uses almost all its land for farming.
2. The island has been almost completely cleared of forests, its soil is fertile, and it has few rocky hills.
3. Newfoundland uses the least amount of its land for farming.
4. Large areas of land in three of the provinces are not used for farming because their rocky surface is unsuitable, and because it is difficult and costly to establish transportation routes to serve these areas.
5. Lumbering and fishing are possibilities for supplementary income.

B. Farmers enrich the soil through fertilization methods.

C. 1. Potatoes are Prince Edward Island's chief cash crop.
2. Farmers spray potato fields to protect the crop from insects and plant diseases; the frequency of sprayings depends on the degree to which these threaten the crop.

D. 1. Hay is used as feed for livestock. It is an important crop in Prince Edward Island because horses, dairy and beef cattle are raised there.
2. The use of fertilizers, scientific farming methods, and modern machinery increase the crop yield.
3. Prince Edward Island is known as the Garden of the Gulf because of the great amount of farming carried on in this area.

4. Because dairy products are perishable, dairy farms are located near large population centres and good transportation routes.
5. The Saint John River Valley has a mild climate, a long growing season and plentiful rainfall, making it the most important farming area in New Brunswick. Its chief product is potatoes.

E. 1. The tides of the Bay of Fundy rise 60-70 feet.
2. The south shore of Northumberland Strait is well-suited to farming because the land is flat, temperatures are moderate, rainfall is sufficient, and the growing season is long. (See Map 55 for the location of this area.)

F. 1. The Annapolis Valley consists of well-cultivated, gently sloping, fertile farmland surrounded by low wooded hills with rounded slopes. Beyond the hills is a large body of water, the Annapolis River.
2. Fruits and vegetables are raised in the Annapolis Valley.
3. The highlands shelter the valley from cold winds and prevent the fast run-off of water needed for the soil.

G. 1. Kentville is the canning centre for apple juice and apple sauce.
2. Most of the farm products of the Atlantic Provinces are consumed locally. Potatoes and apples are the principal exports.

Page 93: HALIFAX–CANADA'S GREATEST ATLANTIC PORT

A. 1. Map 56 indicates that the land around Halifax is irregular and rocky. On the map, railways are symbolized by black lines crossed at regular intervals by short black lines.
2. The railway lines have many bends because they follow the rough, uneven contour of the land.
3. The vegetation in the Halifax area consists mainly of trees, mostly conifers, with some deciduous trees such as sugar maple, birch, and ash.
4. The North West Arm is too narrow for safe navigation; in addition, the docks' present location is closer to the important centre of Dartmouth, and provides easy access to the Bedford Basin.
5. The harbour between Halifax and Dartmouth can be crossed by ferryboats or by bridge.

B. 1. Because there is little soil in this area, excavating involves digging directly into the rock surface, which is both difficult and expensive.
2. The rocky land in this area makes farming almost impossible.

C. 1. Halifax is located on a peninsula and is joined to the mainland by an isthmus.
2. a. Bedford Basin is the large body of water north of Halifax.
b. Bedford Basin serves as a supplementary harbour where ships can be moored safely, close to the main harbour and dock area.
c. The Narrows connects the bay to the main harbour.

D. 1. The North West Arm offers sailing, boating and swimming.
2. The large docks, the number of ships in the port, the many roads and railways, and the large buildings near the docks all indicate that Halifax is an important port.
3. The harbour in Halifax is important in winter because, unlike some other large ports, its water does not freeze over.

E. 1.

MANUFACTURED FROM CANADIAN RAW MATERIALS	MANUFACTURED FROM IMPORTED RAW MATERIALS
Steel (Sydney)	Cocoa (West Indies)
Paper (Corner Brook)	Coffee (Brazil)
Canned Fruit (Grimsby)	
Dairy Products (Annapolis Valley)	
Petroleum (Montreal)	
Wheat (Fort William)	
Gypsum (Windsor)	

F. The parts of the car are made in Sweden. The ice-free port makes it possible to import these parts throughout the year. This compensates for the disadvantage of having to transport the finished automobiles to the densely populated areas.

G. 1. The citadel is almost in the centre of Map 56, and can be seen at the right-hand end of the light-coloured space in the background of the photograph.
   2. The high peninsula on which the fort was built is, by definition, surrounded on three sides by water. This put it in a good position to defend the area from attack.
   3. The body of water in the photograph is Halifax Harbour, with Bedford Basin in the background. In the foreground, the shipping and mining industries are visible, and beyond the railway yard is a grain elevator.

H. A location near a seaport is important for a thermal-electric power plant because fuels such as coal and oil are most easily and economically transported by ship, and because a great deal of water is needed to produce the steam that drives the turbine.

I. 1. Dalhousie University is shown in the photograph.
   2. A tourist might wish to visit Halifax and the Atlantic Provinces to view places of historical significance, to take advantage of recreational facilities–boating, fishing, and swimming, and because the summer climate is moderate and the scenery is beautiful. The area also provides excellent fish and lobster.

Chapter 5 THE CENTRAL PLAINS REGION

Page 98: POSITION AND PHYSICAL FEATURES

A. 1. The three Prairie Provinces are Alberta, Saskatchewan, and Manitoba. Alberta is farthest west; Manitoba is farthest east.
   2. The north boundary of the Prairie Provinces is at latitude 60° N.; the south boundary is at latitude 49° N.
      a. The distance between these boundaries is 759 miles. (Each degree of latitude = approximately 69 miles; the difference between the boundaries is 11 degrees. Therefore the distance = 69 x 11, or 759 miles.)
      b. From the east boundary of Manitoba to the west boundary of Alberta, the distance is 850 miles.
      c. The east-west distance is about 100 miles greater than the north-south distance.
   3. The Prairie Provinces are bordered by: British Columbia, the Districts of Mackenzie and Keewatin in the Northwest Territories, Ontario, and the states of Minnesota, North Dakota, and Montana.

B. 1. Prince Albert is an important transportation centre—at the junction of numerous roads and railway lines, and on the the North Saskatchewan River. It is the centre of government for the northern half of the province and it is a religious centre.
   2. The land slopes downward from Lethbridge to Hudson Bay.

C. The four physical Regions within the Prairie Provinces are the Cordillera, the Central Plains, the Canadian Shield, and the Hudson Bay Lowlands.

D. 1. The Manitoba Lowlands, also called the first prairie level, is the lowest plain.
   2. This plain is between 500 and 1,000 feet above sea level.
   3. The flat surface of the area indicates that it was once part of the bed of a glacial lake.
   4. The second prairie level is between 1,600 and 2,400 feet above sea level.
   5. The Manitoba Escarpment separates the first and second prairie levels.
   6. The landform was caused by the erosion of warped sedimentary rocks. Its origin is similar to that of the Niagara Escarpment. (See Question 10.)
   7. Both prairie levels are quite flat.
   8. The Missouri Coteau separates the second and third prairie levels.
   9. The flatness of the third level is broken by gently rolling hills. Its vegetation consists of grassland to the south and parkland to the north.
   10. escarpment: a long, clifflike ridge of land or rock, formed by fracturing of the earth's crust.
       coteau: a French word meaning a hilly, upland region.
       badlands: a barren area where rock has been eroded into various forms.
       timberline: the altitude above sea level at which timber ceases to grow because temperatures are too cold (also called the "tree-line").

Page 100: LAKES AND RIVERS

A. 1. Lake Agassiz was the glacial lake that once occupied parts of Manitoba, Saskatchewan, Ontario, and North Dakota.
   2. The Saskatchewan River flows through the old sea bed.

B. 1. Lake Winnipeg, Lake Winnipegosis, and Lake Manitoba were once part of Lake Agassiz.

C. 1. Both the North Saskatchewan River and the South Saskatchewan River have their sources in the foothills of the Rocky Mountains in Alberta.
   2. The two rivers join to become the Saskatchewan River near Prince Albert.
   3. The Saskatchewan River flows through Tobin Lake, Cumberland Lake, Cedar Lake, Lake Winnipeg, and the Nelson River before it reaches Hudson Bay.
   4. The North Saskatchewan river system is about 750 miles long.
   5. The tributaries of the Mackenzie River are the Peel, Ramparts, Mountain, Keele, Hare Indian, Great Bear, Redstone, Willowlake and Liard rivers.
   6. Much of the river system is fed by the melting snows of the Rocky Mountains.
   7. Inland drainage occurs in hot, dry areas. Here, much of the rainwater does not flow by way of rivers into lakes or other rivers, but soaks into the dry ground or evaporates.
   8. An alkali lake contains natural salts that have dissolved in the water.
   9. Sloughs are large mud-holes useful for watering cattle and for irrigation.

D. 1. Pickerel, whitefish, pike, and perch are the main species caught.
   2. Nets and baited hooks are used to catch the fish.
   3. Winnipeg is near Lake Winnipeg where most of the fishing is carried on. It is a railway centre, important for shipping fish to the United States. It is a large city with facilities for filleting, freezing, processing, and packaging.
   4. Water on the Prairies is used for irrigating farmland, watering cattle, domestic consumption, industrial use, as a source of hydroelectric power, and it provides fishing grounds.

Page 102: CLIMATE

A. 1. Latitude, altitude, and nearness to large bodies of water influence temperatures.

2. The warmest January temperature is found in the area around Lethbridge in Alberta. The coldest January temperature is found in the northwest corner of Manitoba and the northeast corner of Saskatchewan.
   a. The Lethbridge area is farthest south and it gets the benefit of the warm winds that blow across the Rocky Mountains. The cold areas are the farthest north, far from any large body of open water, and in the path of cold arctic air masses.
   b. Grande Prairie is in the path of warm winds that blow across the mountains from the Pacific Ocean.
   c. The average January temperature at Churchill is -17° F.; at Grand Prairie, 5° F.; at Lethbridge, 15° F.; at Winnipeg, 5° F.
   d. The temperatures necessitate warm clothing and well-heated buildings. It would be difficult to pursue many outdoor activities and occupations.

3. The warmest July temperatures are found in the southern parts of the three provinces. The coldest July temperatures are in the Hudson Bay Lowlands and in the mountains of Alberta.
   a. The southern parts of the three provinces have the most southern latitudes, low elevations, and they are in the path of warm air masses from the south. The Hudson Bay Lowlands are farthest north, and in the path of cold arctic air masses that come down from the north. The elevation of the mountains in Alberta accounts for its cold July temperatures.
   b. The sources of the North and South Saskatchewan rivers are high up in the Rocky Mountains, resulting in cool temperatures in these areas.
   c. The average July temperature at Churchill is 54° F.; at Grande Prairie, 60° F.; at Lethbridge, 65° F.; at Winnipeg, 65° F.
   d. The temperature range at Churchill is 71 degrees; at Grande Prairie, 55 degrees; at Lethbridge, 50 degrees; at Winnipeg, 60 degrees. The range at Halifax is 40 degrees, and at Toronto, 47 degrees. These two cities are near large bodies of water which moderate their temperatures.

4. a. i. The abundance of precipitation along the southern part of the British Columbia-Alberta border occurs because the Rocky Mountains cause the air masses from the Pacific Ocean to release their moisture in crossing the mountains.
      ii. Precipitation increases as one goes south from Winnipeg because as warm, moist air from the south meets cool, dry air from the north, the air rises, cools, condenses, and releases the moisture.
      iii. Precipitation is scarce in the south-central area of the Prairies because the air masses that have crossed the Rockies descend and tend to absorb rather than deposit moisture.
   b. Precipitation is most beneficial to crops during May, June, and July.
   c. The greatest amount of precipitation falls during the summer.
   d. Irrigation is often necessary to supplement the rainfall.
   e. i. In order to cross the Rocky Mountains, the rain-bearing air masses must rise to a great height. This causes the moisture in the air to condense and fall. By the time the air masses have reached the eastern slopes of the mountains, they are no longer filled with moisture.
      ii. Rain shadow refers to an area that is sheltered from rain-bearing air masses by high hills or mountains.
      iii. The rain shadow is in the western part of the Central Plains.
      iv. During the winter, the temperature of the westerly winds is warmer than that of the land; during the summer, the winds are cooler than the land.
      v. During the winter in southern Alberta, chinooks—warm winds flowing eastward from the Pacific Ocean—produce sudden high temperatures, often melting several inches of snow in a few hours.

5. a. Large areas of the Prairie Provinces have frost-free periods of fewer than 80 days, making the growing season too short for most types of farming.
   b. The high elevations in these two areas result in their having short frost-free periods.
   c. Arctic air reduces the length of the frost-free period.
   d. i. The greater the elevation, the fewer frost-free days.
      ii. The farther north the latitude, the fewer frost-free days.
      iii. The lower the temperature of the winds, the fewer frost-free days.

6. Referring to Figure 40, students can make a similar graph for Regina, using the information supplied.
   a. Regina receives the most precipitation during the summer.
   b. Without sufficient precipitation, crops will not grow.
   c. This region has a Continental climate, a wide temperature range and low precipitation.

B. 1. Blue is a "cold" colour.
   a. The westerlies and southerlies collide with the Arctic air and turn it eastward across the Prairies.

b. The air from the south is warm and moist because it has passed over the Gulf of Mexico–subtropical water.
c. The air from the south brings moisture mainly to southern Manitoba.

Page 104: FARMING AREAS

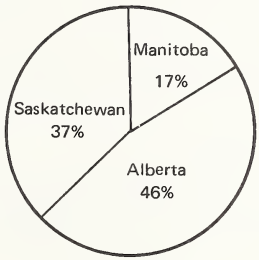
A. 1. The three areas of wheat farming are the Peace River area, a large area in southern Saskatchewan and southern Alberta, and a small area on the south border of Manitoba.
a. Southern Manitoba is least likely to require irrigation.
b. The southern Alberta-Saskatchewan border is most likely to need irrigation.
c. The area in southern Manitoba has an annual precipitation of 18-22 inches and over, while parts of the area on the southern Alberta-Saskatchewan border get under 12 inches.

B. Wheat is the main source of income.

C. 1. The region in the photograph is probably around Peace River because of the large forested area, the mountains in the background, and the deep river valley.

D. 1. Students can refer to Maps 58, 63, and 65.
2. The southern Alberta-Saskatchewan area is too dry for farming, and the southern foothills of Alberta are not flat enough; therefore, these lands are used for grazing.
3. The photograph shows beef cattle. They are heavier than dairy cattle, have different skull features and colours, and have no milk sacs.
4. The hilly land in the photograph, and the absence of mountains in the background, indicate the scene is the southern Alberta-Saskatchewan area.

E. 1. Farmers usually do not depend on only one crop for their income. By raising several crops, or keeping livestock, they can offset the failure of one crop.
2. Large cities create a demand for milk and milk products. In addition, the proximity of dairy farms to markets is important to prevent the products from spoiling en route.
3. The markets for livestock are the large urban centres in Canada and the United States.
4.



5. The photograph was probably taken near Edmonton. Its land is flat, whereas around Calgary the terrain is more uneven, and around Winnipeg the land would be more heavily farmed.

F. 1. In the past, land had to be cleared with axes and handsaws; tree stumps had to be burned, pulled out by horses or cattle, or left to rot; stones had to be gathered by hand and hauled away by horses or cattle. Today power tools, trucks, tractors, bulldozers, and dynamite can be used to clear the land.
2. Earlier, better land was still available farther south. Wheat and other grains that would grow in this area had not yet been developed, and modern machinery to clear the land was not available.
3. Mixed farming is carried on in the Pioneer Fringe.
4. The picture shows rocky hills, a stream, various types of vegetation, and level fields extending up the river valley.
5. Less than a third of the land in the Prairie Provinces is used for farming.
6. A large part is not farmed because the growing season is not long enough, the soil is not suitable, and there is insufficient rainfall.
7. All the big cities of the Prairie Provinces are located around farming areas. Farmers need cities for markets, as a source of farm machinery and other manufactured goods, and for transportation facilities. Conversely, cities need farming areas to supply them with food, and as markets for their manufactured goods.

Wheat

A. 1. Students can refer to Map 65; the areas where wheat is grown are indicated in the legend.

2. The soil of the Prairies is particularly suited to the growing of wheat; the crop can be grown successfully under a wide range of climatic conditions; and its many by-products create a demand for it, and therefore make wheat growing profitable.
3. A comparison of the three maps indicates that areas where wheat is grown successfully correspond roughly to areas having a frost-free period of more than 80 days and 12-16 inches of precipitation.
4. Wheat farming cannot be carried on in dry areas; the crop requires adequate precipitation.
5. Map 63 shows that wheat grows well in areas having 12-16 inches of precipitation.
6. Grain requires a minimum frost-free period of 80 days.
7. Saskatchewan produces the most wheat.
8. The Central Plains grows 96 percent of all the wheat in Canada.

Notes on Photograph
Prairie Town: The three buildings are grain elevators used for storing grain.

B. 1. i. Scientists developed new strains of wheat that–ripened in less than 110 days. (As a result, wheat could now be farmed successfully in areas where the growing season had previously been too short.)
ii. The development of the steel plow–made it possible to cultivate hard clay soils. (Before this development, such soils could not be cultivated with wooden plows.)
iii. Single strand barbed wire fences–enclosed fields for grazing. (Such fences are practical and economical for enclosing ranch land, especially where wood is scarce and wood fences would be too expensive to use to enclose the extensive grazing land.)
iv. Farmers left regular rows of stubble unplowed–in newly plowed fields. (This provided a windbreak to prevent soil erosion.)
v. The invention of the gasoline engine–made possible equipment such as tractors, threshers, combines, and seeding machines. (Such machinery cut down the time and manpower needed for plowing, cutting, threshing, and other farm operations.)

C. 1. Canada exported 65 percent (515,000,000 bushels) of its wheat in 1966.
2. Great Britain, Japan, West Germany, China, Czechoslovakia, Poland, and the Soviet Union are the major buyers of Canadian wheat.
3. a. Grain elevators are used to store wheat that will eventually be sold.
b. Railways carry wheat to ports on the ocean or the Great Lakes, or to urban processing centres.
c. Churchill, Vancouver, Fort William, Montreal, and New York are all ports through which most of the wheat intended for export passes.
d. The St. Lawrence Seaway is used to transport much of the wheat that is exported. Without it, more costly means of transportation by land would be necessary.
e. Huge lake freighters capable of carrying 20,000 tons can load or discharge cargoes of wheat at inland ports along the St. Lawrence–Great Lakes system.

D. 1.

drought:	Through irrigation, the farmer can avoid the dangers of drought.
rust:	Some varieties of wheat are more rust-resistant than others; therefore, the farmer can choose seeds that will not be as vulnerable to damage by rust.
erosion:	By planting rows of trees to act as a windbreak, or by leaving unplowed furrows of stubble at intervals in fallow or cultivated land, erosion of the soil by wind can be controlled. Drainage and irrigation systems can, in some places, help to prevent soil erosion caused by water.
fire:	By maintaining adequate fire-fighting equipment, and taking reasonable precautions against the outbreak of fires, crop losses due to this threat can be prevented.
insect pests:	By spraying his crops with special chemicals, the farmer can ward off insects.
a single type of crop:	A farmer can offset the failure of one crop if he grows several crops.
surplus:	With a knowledge of the supply of and demand for his crops, the farmer may be able to anticipate surpluses and grow other crops, or plant less of those that are not in demand.
market:	The farmer can study national and world market conditions in order to determine what crops will bring the highest prices.

Page 108: DRY BELT
A. 1. Fallow land is land that has been plowed, but is left unplanted or uncultivated for one or more seasons.
2. Fallow land allows the soil to become richer, prevents weeds, and can act as a windbreak for other fields.

3. In the Dry Belt, a field is left fallow every third or fourth year.
4. Wheat is the chief crop in this area.
5. In the Dry Belt, the crop yield is about 15 bushels per acre, as compared with 65 bushels per acre on irrigated land.

B. 1. The Dry Belt consists of the southwest corner of Saskatchewan and the southeast corner of Alberta.
2. Map 63 shows precipitation. Furthermore, the scant vegetation indicates the low amount of rainfall in the area.
3. Lack of rainfall results in dry soil, which is vulnerable to erosion by wind. It also prevents or retards crop growth, and it results in a lack of vegetation which is needed for grazing.
4. The size of an average ranch is two or three square miles. The sparse vegetation necessitates such extensive grazing areas.
5. The rancher provides drinking water for his animals by digging water holes which are then filled from a well.

Notes on Photographs

Dry Farming: The size of the storage buildings, the number of farm houses, and the distance between buildings indicate that the farms are large.

Watering Hole: The windmill is operated by the wind's rotation of large vanes; it is used as a cheap source of power for pumping water.

C. 1. The farmer directs water by means of irrigation ditches.
2. Flood irrigation can only be used on flat land. If the land were not level, the water would run off the field before it had a chance to sink into the ground, and serious erosion would result. In areas of sloping land, sprinkler systems or irrigation pipes must be used.
3. The grain is still green and not very high and the irrigation ditch is full, indicating the picture was taken in the spring.
4. Water cannot run uphill to irrigate the land on higher levels. Sprinkler systems or irrigation systems could be used in hilly country.
5. The annual precipitation in the Dry Belt is 12-14 inches.
6. About 7 inches of precipitation falls during the growing season.
7. This irrigation project will affect about 200,000 acres of land.

D. 1. Earth was used to construct the dams; it was readily available from the excavating that was done to build the reservoir behind the dam.
2. The South Saskatchewan River flows north in this area.
3. The main dam is Gardiner Dam, and the man-made lake is Diefenbaker Lake.

E. 1. If the water level were raised by the main dam, the water would be able to cross the divide and escape down the Qu'Appelle Valley. This loss is prevented by the construction of the Qu'Appelle Dam.

F. 1. The South Saskatchewan River Project benefits Saskatchewan in the following ways:
a. The high dams of the South Saskatchewan River and Qu'Appelle River will create a large lake which will provide a reservoir and a source of potential hydroelectric power.
b. The dry farming areas of the Outlook-Saskatoon districts will have a supply of water for irrigation purposes.
c. The reservoir provides a source of water for cities and farms.
d. Recreational activities—swimming, boating and water skiing—are made possible.

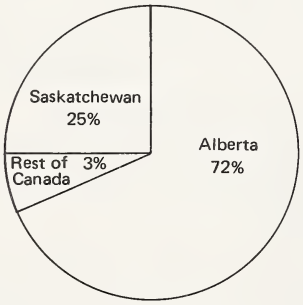
Page 111: MINING

A. 1. Scientists believe that oil and natural gas both came from the same source. Millions of years ago, tiny plants and animals covered most of the earth. When these organisms died, they settled on the ocean floor and were buried under layers of mud and sand. This matter, under heat and pressure, was gradually transformed into the minerals of oil and gas.
2. Maps 58 and 68 indicate that the main oil and gas fields are located on the third prairie level, mostly in the province of Alberta.
3. The third prairie level offers the best potential.
4. Alberta is first and Saskatchewan is second. These two provinces contribute about 97 percent of Canada's total production.
5. Calgary is the centre of the oil industry. Most of the Canadian and United States oil companies have established their headquarters here. This has attracted other industries and created new jobs. As a result, the city has grown considerably.

6. Derrick—a tall, tapering framework over an oil well, which supports the drilling machinery.
   Pump—After an oil or gas well has been in use for some time, the pressure may not be great enough to force the oil or gas to the surface, in which case a pump must be used.
   Crude oil—the oil as it comes from the well, before it has been refined.
   Refinery—where the impurities are removed from the oil; many different products are then made from the refined oil.

B. 1. Drilling a well involves a great outlay of capital for labour and equipment. Therefore, an engineer would be concerned with the likelihood of finding oil; he would investigate the soil and geological conditions, and find out where in the area oil had already been discovered.
2. After the initial cost of laying the pipelines is expended, this means of transporting oil is much cheaper than other means. In addition, transport by pipelines is not hindered by weather or traffic conditions.
3. The Trans Mountain pipeline from Edmonton to Vancouver is 780 miles long, and the Interprovincial pipeline from Edmonton to Port Credit is 2,025 miles long.

C. 1. Oil going from Edmonton to Vancouver across the Cordillera has to climb steep grades; this necessitates many powerful pumping stations along the way, resulting in greater expenditures for construction and maintenance.
2. Three large oil fields in the Central Plains are: Pembina, south of Edmonton; Turner Valley, south of Calgary; and Weyburn, south of Regina.
3. Uses of oil include: it supplies power for transportation via road, rail, water and air; it is a fuel for heating; it is a means of lubrication; it supplies power for industries; it is used in the manufacture of many petroleum products.
4.



D. 1. The Athabaska Tar Sands are in the vicinity of McMurray on the Athabaska River south of Lake Athabaska. The Tar Sands are deposits of sand that contain a tar-like substance called bitumen, which consists of a great deal of oil.
2. Until recently, no practical way of extracting the oil from the bitumen had been found.

E. 1. The two main gas fields in Canada are the Turner Valley field in the Calgary area and the Viking-Kinsella field near Edmonton.
2. Natural gas is used for heating, and in the manufacture of fertilizer, fabrics, paint, and glass.
3. The two main oil pipelines are the Interprovincial pipeline, which runs from Edmonton to Winnipeg, south around Lake Superior and Lake Huron to Sarnia, and finally to Toronto and Montreal, and, the Trans Mountain pipeline, which runs from the Edmonton area, over the mountains through the Kicking Horse Pass, and south to Vancouver.
   The two main gas pipelines are the Trans-Canada pipeline, which runs from the gas fields of Alberta to Winnipeg, across northern Ontario, south to Toronto, and on to Montreal, and, the West Coast pipeline, which runs from the Peace River area, through the mountains by way of the Yellowhead Pass, and south to Vancouver.
4. Cheap and abundant oil and gas have provided the people in the Plains with a clean, inexpensive means of domestic and industrial heating. (Open answer for the second part of the question.)

F. 1. Coal production has declined in the area because it is cheaper to import coal from North America than to mine it locally, and because the use of oil, gas and electricity has cut down the demand for coal.
2. The bituminous coal from Alberta is of a higher quality than the lignite mined in Saskatchewan.

3. lignite—also called brown coal; it contains more carbon than peat, crumbles easily, and is a low-grade coal.
anthracite—a hard coal which gives much heat and little smoke.
bituminous coal—a soft coal which yields pitch or tar when it burns.

G. 1. Potash is used for fertilizer.
2. Students can refer to Map 72. It is suggested that the rest of the information be gathered as a research project.
3. Potash is located at depths varying from 3,000 to 7,000 feet.
4. Between the earth's surface and the potash, there is a layer of porous, semi-saturated rock. This makes shaftsinking impossible because water would exude from the walls of the shaft and flood the mine. The problem may be solved by sinking a cylindrical casing made of metal and concrete down the shaft to keep it dry.
5. Potash is mined in much the same way as other ores. (See the discussion of mining in Chapter 2, page 37.)

H. 1. Natural brine is mined in much the same way as oil or natural gas. A hole is drilled, a pipe is driven down below the surface, and the brine is then pumped out. Rock salt is mined in the same manner as coal.
2. a. In Alberta—Waterways is on the Athabaska River beside McMurray; McMurray is about 160 miles northeast of Lesser Slave Lake; Lindberg is about 2 miles west of Edmonton.
b. In Saskatchewan—Unity is about 100 miles west of Saskatoon; Simpson is about 70 miles southeast of Saskatoon.
c. In Manitoba—Neepawa is about 40 miles west of Portage La Prairie and 100 miles west of Winnipeg.
3. Rock salt is found in Waterways and McMurray, and brine is found in Lindberg, Unity, Simpson, and Neepawa.

Page 113: MANITOBA

A. 1. The three physical Regions of Manitoba are the Hudson Bay Lowlands, the Canadian Shield, and the Central Plains.
2. The Canadian Shield occupies the greatest land area—more than half of Manitoba.

B. 1. Southern Manitoba has attracted settlement because the climate is more moderate, land is better for farming, and roads and railways are easier to build than in the northern parts of the province.

C. 1. Wheat and other grains are grown in the southwest corner of Manitoba.
2. Churchill has large grain elevators for the storage of wheat.
a. Churchill is a port from which wheat is exported to countries overseas. (For additional details, see discussion of Question B.2 on page 116.)
b. The severe Arctic climate keeps the port at Churchill closed for most of the year. Goods can only be exported during August, September, and October.
3. When Manitoba was first explored and settled, water routes provided access into the interior, and at the time, the canoe was the only practical means of transportation.
4. The Central Plains Region has the greatest number of railway lines because it is the most heavily populated area.

D. The rocky surface of the northern Canadian Shield region acts as a barrier to road and railway construction. All traffic going east or west must pass through Winnipeg, making it a transportation centre for people and commodities crossing through central and western Canada.

E. 1. The photograph on page 115 shows several major highways and multiple-track railway lines. (The answer to Question D above also explains Winnipeg's importance as a distributing centre.)
2. Textiles and clothing, petroleum products, railway equipment, and dairy products are produced in Winnipeg.
5. Electricity in the Shield Region is produced by hydroelectric power, except at Churchill which has a thermal-electric plant.
6. Hydroelectric power is used by the mining and smelting industries at Lynn Lake, Thompson, and Flin Flon.

F. 1. Oil is used in the Winnipeg thermal generating plants.
2. Winnipeg does not use water power because there are not enough large rivers near the city.

G. The three centres are shown on Map 71. Flin Flon mines gold, copper, zinc, and silver; Lynn Lake mines nickel and copper; Thompson mines nickel.
Nickel is used to plate many household articles in order to produce a silver-like surface and preserve them from rust. It is also used in alloys to make a light but strong metal used for many tools and metal fixtures.
Copper is used in electrical wiring and fixtures, for ornaments, and as the basis of brass, bronze, and other alloys.
Gold is used for jewelry and ornaments.

Zinc is used in roofing material, paint, rubber, glass, cosmetics, and ointments.
Silver is used for cutlery, dishes, and jewelry.

H. 1. The main ethnic groups found in Manitoba are: English, Scottish, Ukrainian, German, Irish, French, Dutch, Polish, Scandinavian, and native Indian and Eskimo.
2. British–settlements are in all parts of Manitoba.
Ukrainians–one settlement is west of Lake Winnipegosis, another east of the Red River near the United States border, and some Ukrainians live in Winnipeg.
Germans–settlements are found scattered throughout southern Manitoba.
French–settlements are in St. Boniface, across the river from Winnipeg; the settlers here come from the province of Quebec.
Dutch and Polish–settlements are in scattered farming communities throughout Manitoba and Winnipeg.
Indians–settlements are on reservations scattered through the northern part of the province.
3. The population of Alberta has increased rapidly because of discoveries of oil and natural gas. Saskatchewan's population has increased as the demand for its farm produce grew. Manitoba has less farmland, and its mineral deposits are difficult and expensive to reach.

Page 116: SASKATCHEWAN

A. 1. The sources of Saskatchewan's wealth are: agriculture–40 percent, construction–26 percent, manufacturing–18 percent, oil–8 percent.
2. Farms are generally located away from populated centres; their produce is often shipped by rail. For grain or cattle, which must be shipped great distances to markets, railways are essential.
Most of the material needed for construction, such as lumber, cement, metals, and machinery, has to be brought in from other parts of the country.
Railways are extensively used by the manufacturing industry to import raw materials and to export the finished product.
The railways transport oil to and from centres when pipelines, trucks, or oil tankers are not used.

B. 1. By train, it is 356 miles from Regina to Winnipeg; 1,715 miles from Regina to Montreal; and 1,677 miles from Saskatoon to Toronto.
2. The distance from Regina via Churchill to London, England (a sample European port), is shorter than via Montreal:
via Churchill–from Regina to Churchill is 840 miles, and from Churchill to London is 3,500 miles.
via Montreal–from Regina to Port Arthur is 780 miles, from Port Arthur to Montreal is 940 miles, and from Montreal to London is 3,250 miles.
The Churchill route has only one point of transshipment, which lowers the cost, and it is not subject to the charges of travelling on the St. Lawrence Seaway.
3. Except for the months of August-October, Hudson Bay is frozen over.

C. 1. About 96 percent of the wheat grown in Canada is harvested in the Canadian Prairies.
2. Saskatchewan produces about 62 percent of the wheat.
3. Oats, barley, rye, and flaxseed are other crops grown in southern Saskatchewan.
4. Where dry farming is practiced, about half the land is left fallow.
5. By leaving the land fallow, the soil absorbs moisture, and retains it until the following summer because it is not needed for crops or other vegetation. When the land is used again, it will contain moisture from two years of rainfall, helping to overcome drought.
6. Fallow land prevents the growth of weeds; unplowed narrow ridges of turf act as windbreaks and prevent soil erosion.
7. The Cypress Hills area is in the southwest corner of Saskatchewan and the southeast corner of Alberta.
8. The Cypress Hills are hilly, with wooded slopes, in contrast to the flat prairie land.
9. The green grass and thick forest in the photograph indicate that this area receives more rainfall than the surrounding prairies.
10. The land surface in the distance consists of rolling terrain covered with various types of vegetation, including trees.
11. Tourism is the area's main industry.
12. The cattle ranching industry is suggested in the foreground of the picture.

D. 1. Southern Saskatchewan's main oil fields are in the Swift Current and Estevan areas; the main gas field is in the Kerrobert area.

2. Oil and natural gas are thought to have been formed by the transformation of minute plant and animal organisms. Unlike the rock of the Plains region, the rock of the Canadian Shield formed before plant and animal life existed; hence, no gas or oil could be found in this type of rock.
3. The Plains Region is also a source of potash, salt, and coal.
4. The development of oil and natural gas in Saskatchewan means that homes can be heated better for less money, that ample power is available for industry, and that in attracting industries, more job opportunities are opened up.

E. 1. Uranium City is near the north boundary of the province on the shore of Lake Athabaska. (See Map 72.) When the demand for uranium is great, the city's economy is stimulated, but at times of little demand, the city becomes a virtual ghost town. In recent years, the demand for uranium has increased.
2. Mineral resources—gold, silver, zinc, and copper, as well as the rich forest lands and sources of hydroelectric power provide wealth for Saskatchewan.

F. 1. According to Map 74, six railway lines run from the city to other parts of Canada.
2. The industrial areas would be around the oil refineries, abattoirs (slaughterhouses), and railway stations.
3. Map 74 indicates that Waskana Creek is flowing towards the northwest because the dam shown in the middle of the map has created a lake to the southeast. If the creek flowed in the opposite direction, the lake would be on the other side of the dam.
4. On Map 74, the highest contour is marked 1,975 feet and the lowest is 1,875 feet. This means a difference of only 100 feet between the highest and the lowest parts of the city, indicating that the land on which Regina is built is flat.
   Other prairie cities are also flat, and are generally located on rivers, creeks or other bodies of water, with farmland surrounding the urban areas.
5. These locations on the aerial photograph are labelled on Map 74.
   a. Oil refineries may be seen in the upper righthand corner of the photograph.
   b. Waskana Lake can be seen in the lower centre of the picture. The lighter colour of part of the lake indicates very shallow water.
   c. The race track is the oval just north of the railway line in the upper left-hand quarter.
   d. The Parliament Buildings are on the left shore of the lake just above the dam.

Page 120: ALBERTA

A. 1. Southern Alberta and British Columbia are separated by the Rocky Mountains. Railways can only be built between them—in valleys or passes. The railways through the rockies follow three important passes—the Yellowhead Pass, west of Edmonton; the Kicking Horse Pass, west of Calgary; and the Crow's Nest Pass, west of Lethbridge.
2. Railways carry grain and livestock.
3. The cities shown on the map are: B-Banff, C-Calgary, E-Edmonton, J-Jasper, L-Lethbridge, MH-Medicine Hat, and PR-Peace River.
4. The number of railway lines intersecting at Edmonton indicate that it is Alberta's most important city.
5. Banff is known as a summer and winter resort. It has hotels, motels, and cabins, and is a popular convention centre. Hot sulphur springs provide water for swimming pools, and its golf course is famous because of its scenic beauty. During the winter, ski competitions are held here.
   Calgary is a large city between Winnipeg and Vancouver. It is near the ranch lands of the Alberta foothills and is therefore an important meat-packing centre. Other important industries are flour milling and the processing of milk products. Most of the oil and natural gas companies that operate in Alberta have their headquarters in Calgary.
   Edmonton is the capital of the province and is one of the fastest-growing cities in Canada. It is surrounded by coal beds and oil and natural gas fields. Rich farmlands are nearby, and extensive forests are to the north and west.
   Jasper is the administrative centre of Jasper National Park, one of the largest and oldest of Canada's national parks. Beautiful mountain scenery surrounds the city.
   Lethbridge was first established as a coal town to supply fuel to the Canadian Pacific Railway. It became an important ranching centre and later, when the surrounding land was irrigated, it became the distributing and manufacturing centre for a rich agricultural area.
   Medicine Hat is located in the midst of natural gas fields, making it an important centre for this industry. Clay products and pottery are also industries here.
   Peace River serves as an agricultural centre for the Peace River Valley. Lumbering is important in this area, and deposits of natural gas are found here.

B. 1. The cattle shown in the photograph on page 121 are beef cattle. They are heavier than dairy cattle and they have the white faces and red coats of Herefords, a popular breed of beef cattle.
2. The brownish colour of the trees and grass, the short trees, and the lack of water indicate that the area is in the Dry Belt.

C. 1. Beef cattle can range for miles in search of food, but dairy cattle need abundant grazing land close-by. In addition, dairy cattle are usually raised near major consumer markets; the areas in the Prairie Provinces suitable for raising cattle are often hundreds of miles from major markets for milk products.
2. Alberta raises 29 percent of Canada's beef cattle.
3. The main markets for Alberta beef are eastern Canada and the United States.
4. In Alberta, dairy cattle are usally found near urban centres, because of the demand for milk products, and the necessity of having markets close-by to prevent spoilage.

D. 1. Crops are more valuable to Alberta as a source of income than cattle.
2. About 43 percent of the area's farm income comes from livestock; about 28 percent comes from wheat.
3. Perhaps the best area for ranching would be west of Lethbridge and south of Calgary. According to Map 65, it is good cattle country, with more rainfall than in the Dry Belt, and less severe winters. Its proximity to Calgary would provide an important centre for marketing cattle in the Prairies.
4. a. Cattle must be moved frequently from one feeding ground to another, depending on where the best forage is at that time of the year. During the winter, fodder may have to be supplied to the herd. In the dry season, ditches may have to be dug so that enough water can collect to provide drinking holes.
b. Because there are few fences in the cattle country, animals stray over a great area. Cowboys round up the animals and herd them to the railways for delivery to market.
c. Cattle are branded with the initials or symbol of the ranch to which they belong.

E. Oil–Exploration To Storage Tanks

Certain geological structures are known to be favourable to the formation of oil. To determine what type of geological structure lies under the surface, three types of exploration are used:

i. Surface reconnaissance–This is only possible where the surface rock is thin enough for the nature of the rock structure beneath to be seen or determined.
ii. Geophysical measurement–This is the most important method used. Holes are drilled and explosives are inserted. Seismographs measure and record the vibrations caused by the explosions. The records are analyzed by computers, and the actual structure is determined.
iii. Soil analysis–By analyzing the soil, traces of oil or gas may be found which indicate deposits below.

Once the possibility of oil or gas deposits has been established, drilling is begun. A drilling rig is erected and a rotating bit is used to work deeper and deeper into the ground. As the bit goes down, more and more lengths of pipe are added. (The men who operate this rig are called "roughnecks.") If the drilling is successful, the pressure from below will cause the oil to gush to the surface. When this pressure is used up, the oil has to be pumped up. The crude oil is then transported to refineries by pipeline or other means. At the refinery, the crude oil is purified, and the oil is stored in tanks.

F. 1. Edmonton is at latitude 54° N., Vancouver at latitude 49° N., Winnipeg at latitude 50° N., Windsor at latitude 42° N., and Halifax at latitude 45° N.
2. Edmonton is an important city because: it is the capital of the province of Alberta; it is located in the midst of rich coal, oil and natural gas fields; it is in a rich farming area; it is the most important meat packing city in Canada; it is in a strategic location for aircraft flying the Great Circle Route from Canada to Europe; it is an important railway and highway centre, especially for northwestern parts of Canada.

G. 1. The United States oil companies control most of the oil industry in Alberta. They have established their offices in Calgary rather than Edmonton because Calgary is 180 miles closer to the Canada-United States border.
2. Calgary is situated on the Bow River, which is fed by the melting snow and rainfall of the mountains to the west.

Notes on Photograph

Calgary: The many large office buildings and the railroad indicate that Calgary is a centre of commerce.

Page 124: EXTENT

A. 1. Cordillera is a chain of mountains, usually the principal mountain system of a large land mass. The term is applicable to this area because its land is characterized by a system of parallel mountains.

2. The Cordillera extends 4,800 miles.

3. The mountain ranges and valleys run in a northwest-southeast direction.

4. trough: a long, narrow depression or valley between two ridges of mountains, also called a trench.
plateau: a large plain in the mountains or at a considerable height above sea level.
interior: the part of an area or region away from its coast or border.
ridge: a long, narrow chain of hills or mountains.
mountain chain: a connected series of mountains.

5. The Cordillera Region consists of:
mountain chains—Rocky Mountains, Cassiar Mountains, Columbia Mountains, Skeena-Hazelton Mountains, and Coastal Mountains.
troughs—Rocky Mountain Trench and Coastal Trough.
plateaus—Fraser Plateau, Stikine Plateau, and Nechako Plateau.

6. The Laurentians are the oldest of the three mountain systems, about 2,000 million years old. The Appalachians are about 200 million years old. In the Cordillera Region, the sharp, jagged peaks of many of the ranges indicate they are younger; weathering and erosion have not yet worn them down.

B. 1. Advantages:
a. Its mountains make the Cordillera Region a great tourist attraction, for both scenery and recreation.
b. The plentiful rainfall has produced the finest forests in Canada. The mountains are rich in mineral resources.
c. The snow-covered mountains and glaciers supply plenty of fresh water, and the steep slopes help the development of hydroelectric power.

Disadvantages:
a. The Cordillera forms a barrier between the province of British Columbia and the rest of Canada. The cost of building roads and railways is so high that the people of the province are somewhat isolated from other parts of the country.
b. Mountain land cannot be inhabited, cultivated, or used commercially to any appreciable extent. Although the mountains may be rich in natural resources, their steep slopes make it difficult to carry on industries such as forestry or mining. British Columbia has more undeveloped water power than any other province, because the rough surface of the land makes many of the sites practically inaccessible.

2. The Cordillera passes through the Yukon Territory, the Northwest Territories, and the provinces of British Columbia and Alberta.
British Columbia has a coastline on the Pacific Ocean.

Page 125: CLIMATE

A. 1. Parts of the Cordillera are near a large body of water—the Pacific Ocean—which has a warming effect on temperatures.

2. a. The frost-free period becomes shorter as one travels from the coast toward the interior.
b. The frost-free period becomes shorter as one travels up the mountains.
c. The frost-free period becomes shorter as one travels northward along the coast.

3. The greatest number of frost-free days would be found on low land near the coast in the southern part of the region. The lowest number of frost-free days would be found in the northern interior, high in the mountains.

4. Because temperatures drop as altitudes increase, the areas having the fewest frost-free days correspond roughly to the areas where high mountains are found.

B. 1. The long frost-free period along the west coast of the Queen Charlotte Islands is caused by the moderating influence of the Pacific Ocean, and by the warm currents that come across the ocean from Japan.

2. The warm currents from Japan flow northward.

3. The frost-free period at Prince Rupert is 160-200 days. At Cranbrook, it is 80-120 days. Prince Rupert is located north of Cranbrook, but its location is on the coast. Cranbrook is both further inland and has a higher elevation, hence its shorter frost-free period.

4. a. The farther north the latitude, the fewer frost-free days.
b. The higher the altitude, the fewer frost-free days.
c. The nearer a place is to large bodies of water, the more frost-free days it has.

5. The largest centres of population would be found in the southern part of the Region along the coast. Here summers are longest and the climate is mild. This part of the province is the most suitable for agriculture, also a factor in attracting large populations.

C. 1. The map shows the amount of precipitation for the growing season.
2. Most of the heavy rains fall on the west coast and on the western side of the ranges. Rainfall decreases as one proceeds eastward, indicating that the prevailing winds are from the west.
3. Because precipitation in this Region is largely the effect of the mountains, changes in the amount of rainfall suggest changes in the elevation of the land. Thus the isohyets (lines on a map connecting points having equal rainfall at certain times of the year) correspond roughly to the heights, both running parallel to the coast.
4. If the mountain ranges extended from east to west, the pattern of precipitation would tend to parallel the lines of latitude.
5. The westerlies pick up their moisture over the Pacific Ocean.

D. 1. The prevailing westerly winds have already discharged much of their moisture in crossing the Coast Range and Columbia Range, resulting in little moisture for the Rockies.
2. Kamloops and Victoria are both located in a rain-shadow area—areas sheltered by mountains from rain-bearing air masses.

E. 1. The Arctic winds that pass over Aklavik are very cold and therefore contain little moisture. In this lowland area, there is no higher ground to cause the air to rise and produce precipitation. Because of the cold climate, the precipitation that does fall is in the form of snow.
2. a. The best area for agriculture is the southern part of the province because it has a good combination of adequate rainfall, moderate temperatures, and a sufficiently long frost-free period.
b. The worst area for agriculture is the middle of the northern part of the province where the land is mountainous, precipitation is light, and the frost-free period is short.
c. The vegetation found on the slopes of the Coast Range consists of dense forests with tall, thick timber stands.

Page 128: BRITISH COLUMBIA

A. 1. British Columbia is bordered on the north by the Yukon and Northwest Territories, on the south by Washington, Idaho and Montana, on the east by the province of Alberta, and on the northwest by Alaska.
2. Alaska, Washington, Idaho and Montana are part of the United States.
3. Because the mountains form a natural barrier to trade with the rest of Canada, British Columbia finds it more economical to ship goods to the United States and overseas.

B. 1. The mountain chains run in a northwest-southeast direction.
2. If its mountains ran from east to west, British Columbia would have much easier access to the rest of Canada; roads and railways could be built along the river valleys. However, parts of British Columbia in the north, central, and the south would then be more isolated from one another.
3. The Atlantic Provinces are also isolated from the rest of Canada, but because the Appalachians are not as high as the Rockies, and the St. Lawrence River provides a transportation route through the mountains, the Atlantic Provinces are less isolated than British Columbia.
4. It is suggested that students obtain this material as an outside research project.
5. The Tramontane Plain belongs to the Central Plains Region.
6. See Map 98.
7. a. The Rocky Mountains are the highest range.
b. The highest point is almost 13,000 feet.
c. The Coast-Cascade Range is almost 12,000 feet high.
d. Okanagan Valley is 1,000 feet above sea level; Purcell Trench is 500 feet above sea level; Rocky Mountain Trench is 2,000 feet above sea level.
e. The altitude of the Insular Mountains is about 4,000 feet.
f. British Columbia gets more than adequate rainfall; it has many mountains that are covered with snow most of the year; there are few flat areas in the province. The result is a great many fast, powerful, even-flowing rivers, ideal for the development of hydroelectric power.
g. Vertical exaggeration is the method used to show vertical distances on profile maps. These distances must always be on a much larger scale than horizontal distances because if both vertical and horizontal distances were on the same scale, it would be impossible to draw a diagram that showed anything. Quite high mountains would not show up as more than the width of a pencil mark, and low hills could not be indicated at all. Vertical exaggeration (VE) is calculated by dividing the vertical scale (VS) of the profile by the horizontal scale (HS): VE = VS ÷ HS.

Page 130: FORESTS

A. 1. British Columbia produced 1,621,649,000 cubic feet of lumber in 1963.
2. British Columbia supplied about 44 percent of Canada's total timber production.
3.

B. 1. About two-thirds of British Columbia's lumber is cut in the rain forests along the coast.
2. The heavy rainfall and the long growing season are responsible for the tall, dense forests.
3. In the southern half of this belt, the most important tree is the Douglas Fir, and in the northern half, it is the Sitka Spruce.

C. 1. Much of the forest area is inaccessible for cutting operations, and it is too costly to get the timber out and to get men, supplies, and machinery in. In addition, much of the soil and climate is unsuitable for commercial forests.
2-3. It is suggested that students do outside research to gather this material. Map 80 may be helpful.
4. a. Douglas Fir–largest Canadian tree; lumber noted for strength.
b. Red Cedar–used for roof shingles.
c. Hemlock–brittle wood used for pulp.
d. Sitka Spruce–light, used in construction of airplanes.
e. Ponderosa Pine–requires only 12-15 inches of rain a year.
f. Lodgepole Pine–grows quickly in burned-over areas.
5. a. The logs are kept together by means of a boom, which consists of large logs fastened together by heavy chains. The word "boom" may refer to either the barrier of logs fastened together, or to both the barrier and the logs contained within it.
b. The large freighter docked close to the piles of lumber indicates that this lumber is being exported by ship.
c. The size of the freighter indicates that it is an ocean-going vessel.
d. The mill produces lumber, as can be seen in the photograph of Port Alberni.
6. a. Port Alberni has mild temperatures and a lot of rainfall. In British Columbia, this type of climate is only found near the coast.
b. The growing season in the area is about 9 months.
c. The area receives about 60 inches of precipitation annually, and about 25 inches during the growing season.

D. 1. The tree shown in the photograph is the Douglas Fir.
2. Douglas Fir is strong, hard, and it takes a good finish. In addition, many of these trees are free of branches for one-third of their length and thus provide knot-free lumber.
3. The trees are cut down by one man operating a power-driven saw. Steel wedges are driven into the cut made by the saw so that the tree will fall in the right direction.

E. 1. A boom is attached to the spar by cables, which then swing the logs onto trucks.
2. Many of the rivers in the mountains of British Columbia flow too rapidly and are too steep for logs to be floated down them.
3. Logs are gathered together into booms and then towed by tugs to the mill.

F. 1. Mouths of rivers are good locations for mills because the lower part of the river can be used for the towing of logs to the mill or as a storage area where the logs can be kept until the mill is ready to cut them. Furthermore, the costs of transshipment are avoided because ocean-going vessels can load at the sawmill.
2. British Columbia manufactures flooring, plywood, shingles, door and wall panels, and planking for fishing boats.

G. 1. "Patch logging" means cutting only patches of the forest, leaving the rest standing.
2. The cut patches are reseeded by the timber that is left standing.
3. The remaining stands of timber collect the rainwater and thus prevent floods and sudden run-offs. They also act as a windbreak to prevent soil erosion.

Page 134: FISHING

A. 1. The value of fishery products in British Columbia is $80,000,000; in Newfoundland, the value is $44,000,000.
2. In 1963, the codfish catch of Newfoundland was worth about $21,000,000, while British Columbia's salmon catch was worth about $30,000,000.
3. See Figure 56 on page 135.
4. It is suggested that students do outside research to gather this material.

B. 1. The Coast Mountains contain these fiords.
2. The inlets and fiords along the coast provide good fishing grounds, safe harbours, and excellent sites for fish-processing plants.
3. Industries in these centres that are connected with fishing are fish-processing and canning.

C. 1. Salmon is processed by curing, freezing, and canning.
2. Fish-processing plants are located near salmon fishing grounds.
3. The coho, spring, pink and chum are other species of salmon that are caught.

D. 1. Spawn means to deposit eggs directly into the water.
2. Salmon must often go through rapids, waterfalls, streams obstructed by logging operations, and over dams and sharp rocks to reach their spawning grounds.

E. 1. A fish ladder is a series of ascending pools built by man to enable salmon or other fish to swim upstream around or over a dam. (The locks on a canal serve an analogous function for ships.)
2. Fish die after they spawn.

F. 1. Industrial wastes pollute streams and sometimes kill the salmon. Dams make it difficult for salmon to swim upstream, even with fish ladders, and impossible for them to swim downstream. The machinery of hydro-electric plants can kill the salmon. Logging operations clog streams and often, in changing the environment, destroy spawning areas.
2. The government might conserve the salmon by: prohibiting catching fish under a certain size, prohibiting catching fish of any size at the mouth of a river where spawning occurs, limiting the number of dams that can be built, controlling logging operations so that the environment is not threatened, controlling industrial pollution.

Notes on Photograph

Fiords: No large buildings or installations that might indicate industry are evident in the photograph. The settlement might be a fishing community, a logging centre or a recreation area.

Page 136: WATER POWER AND MINING

A. 1. British Columbia is mountainous, and from mountains come powerful, fast-flowing rivers. Because the mountains provide a continual source of snow and ice, the flow of the rivers is fairly uniform throughout the year. There are few large lowland areas near the mouths of these rivers that would reduce their speed or force. In addition, the adequate rainfall in British Columbia helps its water power potential.
2. a. Prince Rupert gets its hydroelectric power from the Kemano River.
b. Kitimat gets power from the Kemano River.
c. Vancouver gets power from the Capilano Creek and the Stave River.
d. Trail gets power from the Kootenay River.
e. Victoria gets power from Ladore Falls, halfway up the east coast of Vancouver Island.
f. Penticton gets power from the Kootenay River by way of Trail.
3. Vancouver gets its oil from Edmonton, and its natural gas from the Dawson Creek area, near the Alberta border.
4. Oil and gas pipelines follow the courses of rivers closely because the land surface is level, making it easier and cheaper to lay pipes than in mountainous areas. Maintenance is also cheaper because fewer pumping stations are necessary.
5. British Columbia's mineral resources have not been fully developed because the terrain makes prospecting and development so expensive that often the costs of mining and transporting ore exceed the income from sales.

B. 1. Lead is used in roofing, paints, foil, ammunition, storage batteries, type metal, and solder. Zinc is used in making brass and other alloys, for galvanized iron, in making paint and electric batteries, and in medicine.
2. The world's largest lead-zinc mine is the Sullivan Mine at Kimberley, located in the southeast corner of British Columbia.

C. Referring to the "pie" graph for Question A. 3 on page 130, students can make similar graphs indicating how British Columbia's lead and zinc production compares with that of the rest of Canada.

D. 1. Trail is a good location for large smelters because it is close to the source of raw materials—the Sullivan Mine at Kimberley, and a coal supply at Fernie, and because it is close to hydroelectric power plants on the Kootenay River.
2. Trail is located on the Columbia River.
3. The flat, fertile valley enables the inhabitants to grow much of their own food.
4. The coal used at Trail is mined at Fernie.
5. Trail is connected to other centres by roads and railways.

E. 1. Kitimat is located on level land suitable for construction.
2. Kitimat was selected as the site of an aluminium smelter because it has excellent deep-sea anchorage, and it is near a source of power at Kemano.
3. From Vancouver to Kitimat is 400 air miles.
4. The raw materials required in the production of aluminium include bauxite (from Guyana and Jamaica), cryolite (from Europe), fluorspar (from Newfoundland), and soda ash, lime, petroleum coke, and pitch, all from a variety of sources.
5. The aluminium produced at Kitimat is marketed primarily in the United States, in Great Britain and in Canada.

F. 1. Kemano, shown in the middle of Figure 57, is the site of the hydroelectric generating station that provides power for Kitimat.
2. The station at Kemano is 50 miles from Kitimat.
3. Kitimat was not located at Kemano because the ground there was not level enough for building. Furthermore, ocean-going ships can sail directly to Kitimat, but not to Kemano.

Kitimat

1. The smelter is at the lower left corner of both the map and photograph. That the land is level is implied on the map by the lack of contour lines around the smelter; the marsh symbol also indicates low, flat land. In addition, the contours on either side of the river, its meandering flow, and the marsh indicate this is an area that was once a river bed, and would therefore be flat.
   a. A water location is essential for the site of a smelter because the production of aluminium requires an abundant supply of cheap power.
   b. The smelter is located at less than 100 feet above sea level.
   c. The highest elevation within a 2-mile radius of the smelter is a hill 1,700 feet above sea level, about 1½ miles west of the smelter.
2. Residential areas are located away from the smelter to avoid the noise and fumes emanating from it.
   a. The highway follows higher ground than the railway—the railway runs through low, swampy, level ground. Much more ballast would be needed on swampy ground to build a firm roadbed for a highway than for a railway. And, curves and hills are not as much of a problem for cars and trucks as they are for trains.
   b. Nechako Centre has the greatest elevation: 400-500 feet.
   c. Nechako Centre has the largest population.
3. To the west the land rises sharply to form high hills, while to the east the land is flat.
4. A delta can be seen at the top of Kitimat Arm, near the bottom central edge of the photograph.
5. The shading in the photograph shows the steep rise of the land; the contour lines on Map 84 indicate the same feature.

Page 142: FARMING

A. 1. a. Much of the land is too rocky and mountainous for farming.
   b. Because of its high elevations, much of the climate is too cold for farming.
   c. The mountainous land has made building costly and difficult, resulting in few roads and railways. Without good transportation facilities, farmers cannot market their crops successfully.
2. It is suggested that students do outside research to gather this material.

B. 1. The flat land was caused by the action of the Fraser River. Its course changed over the centuries and produced a broad river valley.
2. The frost-free period in the lower Fraser Valley is 160-200 days.

C. Perishable commodities can be produced and sold in this area because farmers have access to roads and railways, and they are close to population centres.

D. 1. a. The photograph indicates that the Fraser Plateau is good cattle country: grazing land and sufficient water (implied by the vegetation and creek) are available.
b. The soil seems dry and vegetation is sparse on the mountain slopes, indicating insufficient rainfall for agriculture.
2. Agriculture is difficult in this Region because much of the surface is rocky and uneven, the soil is not very good, and the rainfall is insufficient.
3. The main crops of the area are hay, oats and other feed for livestock.

E. 1. The Okanagan Valley is famous for its fruit.
2. Despite only 10 inches of rainfall, crops can be grown in the valley because lakes and rivers have been dammed to provide reservoirs which are then used as a source for irrigating the land.
3. Crops grown here include: apples, pears, peaches, apricots, cherries, plums, grapes, melons and cantaloupe.
4. Vegetables—beans, onions, potatoes, tomatoes, celery, lettuce and pumpkins—are grown farther north.

F. Old lake beds are generally suited for agriculture because they are flat and usually have fertile soil.

G. 1. The frost-free period in this area is about 60 days.
2. The chief cash crops are timothy hay and clover seed.

Notes on Photographs
Lower Fraser Valley: The relief in this area is level.
Okanagan Valley: The crop shown in the photograph is grapes.
Peach River Area: Wheat and other grains are grown here.

Page 144: VANCOUVER AND VICTORIA

A. 1. The photograph shows a variety of ships in the harbour, suggesting heavy sea traffic; there are many large buildings which look like industrial plants and storage facilities; the railway lines indicate that the harbour is an important transshipment point.
2. Vancouver is one of the finest harbours in the world because it is not subject to extremes of weather, the shallow water provides good anchorage, and the shores of Burrard Inlet provide excellent shelter for vessels. Next to Montreal, Vancouver has the best harbour facilities—docks, warehouses, and railways—in Canada.
3.

	VANCOUVER	HALIFAX
Water Temperature	warmer than Halifax	colder
Size	44 square miles	9 square miles
Population	500,000	93,000
Countries Served	United States Japan China Other Asian countries Australia	United States Great Britain Europe West Indies South America
Competition from Other Canadian Ports	Victoria	Montreal Quebec City Saint John

4. Vancouver handles more than double the tonnage handled at Halifax.
5. a. unrefined sugar–imported from Cuba.
   b. tea–imported from China.
   c. lumber–exported from Saskatchewan.
   d. rubber–imported from Brazil.
   e. fish products–exported from British Columbia.
   f. wheat–exported from Saskatchewan.
   g. coffee beans–imported from Columbia and Brazil.
   h. pepper–imported from French Guiana.
6. During the winter, large supplies of wheat are available from the harvest of the preceding summer, and the summer port of Churchill is closed (meaning more traffic for Vancouver). Wheat is exported to China, Japan, India and North Korea.

B. 1. Cities in the Fraser delta are: Vancouver, North Vancouver, West Vancouver, Chilliwack, New Westminster, Port Coquitlam and White Rock.
2. Vancouver is a successful manufacturing area because: it has a densely populated area which supplies workers and a local market; good transportation routes provide both a means of getting raw materials, and access to distant markets; the availability of cheap and abundant power sources reduces the costs of production.
3. In order of importance, the three most important industries in British Columbia are: wood products, food and beverages, and paper products.
4. Because it is at the end of the Fraser River, Vancouver is the natural destination for goods transported by road or rail from the interior. Because of its excellent harbour, it is also the destination for goods imported from overseas. In both cases, goods reaching Vancouver can be marketed there or distributed to other parts of Canada or to other countries.
5. Vancouver and Victoria are linked by a ferry service.

C. 1. The climate of Victoria is milder than that of Vancouver, with less rain and a longer frost-free period.
2. Victoria gets less precipitation than Vancouver because it is located in the rain shadow of the mountains that form Vancouver Island.
3. Vancouver is on the mainland and linked to major roads and railway lines. The use of Victoria as a seaport necessitates the transshipment of all cargoes to and from the mainland.
4. Victoria is largely a residential city with many beautiful parks, homes, and gardens, and an exceptionally pleasant climate.
5. The following are suggestions. The students' answers, however, because they are based on personal preference, may disagree with those below.
   a. a manufacturer–Vancouver, because it is an important industrial and manufacturing centre.
   b. a scholar–Vancouver, because the University of British Columbia and Simon Fraser University are here.
   c. a politician–Victoria, because it is the capital of British Columbia.
   d. a retired naval officer–Victoria, because it is the home of an important naval base, and because it is a pleasant city (see answer to Question 4 above).

Page 148: DESCRIPTION

A. 1. Maps 1, 7, and 85 provide useful references.
2. Mt. Logan, 19,850 feet high, is the highest peak. It is located just north of the intersection of latitude 60° W. and longitude 140° N.
3. The chief occupations in these towns involve services—government officials, police, doctors, teachers, missionaries; and commerce—merchants, suppliers, distributors.
4. The Cordillera is closer to the Pacific Ocean; its moderating effect on temperatures accounts for the climate being warmer in the Cordillera than in the Plains Region.
5. In building roads, an engineer would have to follow the river valleys in order to keep the grade of the roads as low as possible.

B. 1. See Maps 1, 7, 41, 60 and 85.
2. All these settlements are on lakes or rivers that are part of the Mackenzie River system.
3. The colder weather, shorter growing season, and lesser rainfall result in trees being shorter here than those found along the coast of British Columbia.
4. Factors aiding vegetation growth are: the trees shown in the photograph are near a large body of water, which supplies moisture; the soil in the area is probably fertile (humus has accumulated over the centuries); and this area has very long days during the summer.
5. Lumbering is an occupation suggested by the photograph.

C. 1. Map 1 indicates the locations of these areas.
2. "Little sticks" is a good name for these trees because they are small, have little foliage, and look more like sticks than trees.
3. Trees are smaller and fewer here than in Ontario or British Columbia because of the severe climate and short growing season.
4. Fishing is the main industry of villages on Great Slave Lake.
   a. The fish are marketed in Edmonton or other centres in southern Alberta. Some are flown to the United States.
   b. In order to protect the fishing industry, the Canadian government limits the amount of fish that may be caught each year.

D. 1. See Maps 1, 41, 85, and Figure 58.
2. Tundra consists of vast, nearly level, treeless plains in Arctic or sub-Arctic areas. Because the ground is frozen a few inches below the surface, only moss, lichens, and dwarf shrubs can grow.
3. Tundra is associated with a cold, dry climate and short summers.
4. a. permafrost—permanently frozen subsoil. It may begin only a few inches beneath the earth's surface and extend downward 1,000 feet or more.
   b. lichen—a plant that resembles moss and grows on trees and rocks. It is one of the most important types of vegetation in the tundra area and provides food for the caribou.
   c. Arctic Circle—an imaginary line drawn parallel to the equator, at 23° 28′ S. of the North Pole. It is located between the North Frigid Zone and the North Temperate Zone.
   d. permanent polar ice—the ice surrounding the Poles, which never melts.
5. Most of this land belongs to the Northlands part of the Canadian Shield Region.
6. The land is low, stony, and has little vegetation.
7. The chief means of livelihood in the area are fishing, and hunting and trapping fur-bearing animals.

E. 1. Referring to Figure 58, and using Inuvik as a point of reference, students can judge where to draw the dotted line on their maps.
2. 2,000 miles from east to west is indicated in Figure 58.
3. The latitude of this area is 65° N.
4. Using the rivers as a clue, the land appears to slope to the northeast.
5. The sun is over the North Pole. Therefore:
   a. The direction from Coppermine towards the sun is north.
   b. From Inuvik towards the sun is north.
   c. From Repulse Bay towards the sun is north.
6. Nowhere in Canada, south of the Arctic Circle, does the sun ever appear to be due north.
7. Because the land shown in the sketch below the Arctic Circle is in darkness, and the land within the Arctic Circle is in daylight, it must be around the time of the summer solstice (June 21), in the evening.

Page 150: EXTENT

A. 1. a. The Northlands are located north of—Lat. 60° N.
   b. The regions forming this area are—the Cordillera, the Central Plains, and the Canadian Shield.

c. The total area contained is—40 percent of all Canada.
d. The territories making up this region are—the Yukon Territory and the Northwest Territories.
e. Most of the Northlands is situated in—the west half of Canada.

2. a. See Map 1.
b. See Map 85.
c. See legend for Map 85.
d. Refer to atlas; Map 2 may be helpful.

3. Alert, Halifax and Vancouver are all located on oceans at extreme points of Canada. By joining these centres with straight lines, a triangle is formed.
4. The distance from Alert to Vancouver is 2,700 miles. Alert is at latitude 82° 15′ N. If one travelled the same distance going southward from Windsor, one would arrive in Columbia, South America, or in the Pacific Ocean.
5. The latitude of the Arctic Circle is 66° 33′ N.

B. 1. Alert is located on the northern tip of Ellesmere Island in the Northwest Territories (see Map 1 where Ellesmere Island is labelled), about 518 miles from the North Pole.
2. The latitude of the North Pole is 90° N.
3. All locations on the earth are south of the North Pole.
4. a. Boundaries 1, 2, 3 are the Arctic Circle, the 51st parallel, and the border between the Canadian provinces and the territories, respectively.
b. Countries 4, 5, 6 are the United Kingdom, Greenland, and the Soviet Union, respectively.
c. Centres 7, 8, 9 are Vancouver, Halifax, and St. John's, respectively.

C. Because of the curvature of the earth, polar routes are shorter.

Page 152: SETTLEMENTS

A. Whitehorse, with a population of about 5,000, is the largest centre in the Northlands area. It is the capital of the Yukon Territory and an important transportation centre.

Dawson was once an important mining town. During the gold rush of 1898, its population was 25,000; today it is less than 1,000, and little more than a ghost town.

Fort Smith is the administrative centre of the MacKenzie district of the Northwest Territories, and the hub of the uranium industry in the Great Bear Lake area.

Yellowknife has a population of almost 4,000 and is the second largest centre in the Northwest Territories. Gold was discovered at Yellowknife in 1934, and again in 1944.

Inuvik, at the mouth of the Mackenzie River, is in a strategic geographical position and has become the business centre of the western Arctic. The markets for reindeer meat and muskrat pelts are controlled here. Inuvik has a weather station, a broadcasting station, and an airport.

B. 1. The most common fuel used in this area is oil.
2. The houses are built of wood because it is available locally; brick, stone and other materials would have to be imported.
3. Houses lack cellars because of the difficulties of digging into permafrost.
4. The means of transportation between these centres is airplane for long distances. During the summer, boats and barges are used on navigable rivers; during the winter, dog teams and snowmobiles are used.
5. Because of the nature of the land surface, the lack of roadbuilding material, and the severe climate, there are few roads or railways in the area.

Page 152: SUPPLY SHIP

1. The water is not frozen, indicating that the picture was taken in late summer.
2. Most of these settlements are visited by supply ships only once a year.
3. The long distance from the manufacturer raises the prices of goods.
4. Airplanes are not used because some goods are too bulky and heavy, making shipping costs prohibitive, and because many of the northern centres have no suitable landing facilities.
5. It is clear that the weather is cold because the people are warmly dressed.
6. Other important means of transport in the area are dog sled and snowmobile.

Page 152: TRADING POST

1. Eskimos and Indians usually trade furs or meat for manufactured products. Sometimes they use small sticks in order to keep track of the value of the goods.
2. An Eskimo hunter would probably need fuel oil, ammunition, clothing or fabric, food, tobacco, toys, and tools.
3. Pelts often used in trade include beaver, ermine, fisher, fox, marten, mink and muskrat.
4. The Eskimo and the Indian have learned to follow the white man's way of life in many respects, abandoning many of their ways. They no longer have to make such items as axes, kettles, pails, and lanterns, and the availability of prepared foods eliminates the need for much of their hunting.

Page 152: FISHING

1. Fish—trout, whitefish, or Arctic char.
   Wildlife—in the ocean: whales, seals, and polar bear; on the tundra: caribou; in the forest: moose, deer, wolves, fox, fisher, marten, lynx, muskrat, and beaver.
2. The larger animals—whales, seals, moose, and deer—supply food for men and dogs. Whales and seals supply oil for heating and light. The hides are used to make tents and clothing; fur pelts are traded for food and supplies; animal sinews are used for thread or made into cord; bones and ivory are used to make tools and other implements.
3. Great Slave Lake supplies tons of commercial fish each year. The fishing industry is growing here because fish in the Great Lakes and other parts of Canada are becoming scarce; at the same time, the increasing population raises the demand for fish.

Page 152: AGRICULTURE

A. Vegetables are grown in the Northlands along the valleys of the Teslin River and the Yukon River, on the Liard Plain, in the area around Fort Simpson, and along the Hay River, southeast of Great Slave Lake. These areas are in sheltered river valleys where the soil is fertile and the summer days are long.
B. Because of the permafrost, the rain that does fall cannot be drained away, and, because temperatures are rarely very high, the amount of evaporation is low.

Page 153: HERDING

1. Reindeer meat supplies the Eskimos with food. The skins are used for clothing and tents, the sinews are used for thread, and the bones are used for tools and weapons.
2. The herds graze west of the Mackenzie River delta not far from Inuvik.
3. The herding of reindeer is a new kind of ranching. It allows the Eskimos to make a living without having to move from place to place; thus new settlements are created.
4. The Canadian government obtained the reindeer from Alaska.

Page 156: PHYSICAL REGIONS

A. 1. a. The Appalachian Region is hilly with a rocky surface.
b. The Great Lakes and St. Lawrence Lowlands Region is generally flat with some areas of low, rounded hills.
c. The Canadian Shield Region is an area of rocky hills, valleys, rivers, lakes and swamps.
d. The Central Plains Region is an area of flat or gently rolling plains, with few lakes or rivers. The land rises from lowlands in Manitoba to the foothills of the Rocky Mountains.
e. The Cordillera Region is an area of high mountain ranges separated by deep valleys and rough plateaus.

2. a. The rocky hills and poor soil of the Appalachian Region have limited settlement, transportation, and industrial and agricultural development.
b. After the thick forests of the Great Lakes and St. Lawrence Lowlands Region were cleared, the area was well-suited for settlement.
c. The rocky terrain of the Canadian Shield, its vast size, and its harsh climate inhibit the development of the region.
d. The few navigable rivers, and the vast size of the Central Plains made the region difficult to travel through until the railways were built. Its thick clay soil was almost impossible to cultivate until the development of the steel plow.
e. The mountains of the Cordillera Region have limited the development of transportation facilities and to some extent, have cut the region off from the rest of Canada.

3. a. The Appalachian Region was the home of the first settlers in Canada.
b. The Great Lakes and St. Lawrence Lowlands Region has probably had the greatest influence on Canada's development. Its rich agricultural and industrial potential and its suitability for settlement are significant to Canada's growth.
c. The Canadian Shield Region was rich in furs, which attracted traders and explorers who established travel routes and built trading posts which later became big cities. The discovery of great mineral wealth further opened up the land for settlement and development.
d. The Central Plains Region is the major grain-growing area in Canada. Its sources of oil, gas, uranium and potash have made this region vital to the country's economy.
e. The Cordillera Region has provided Canada with some wealth from lumber, fishing and tourism. However, mountains prevent extensive development of many parts of the region.

4. a. Because most of the minerals of the Shield are on or near the surface, they have been comparatively easy to mine.
b. Because the Central Plains are flat, with few obstacles, such as mountains, lakes, or rivers, building railways here has been comparatively easy.
c. The rivers of the west coast are a valuable source of water power for sawmills and pulp and paper mills. The mountain fiords are useful for transporting logs to the coast.
d. The flat plain of the Lowlands is ideal for almost every type of farming.
e. The rocky, wooded hills, the fertile river valleys, and the ragged coastlines combine to make the Appalachians ideal for touring.

5. Almost half of Canada (49.3 percent) is occupied by the Shield–about 1,755,000 square miles.

6. The smallest Region, the Great Lakes and St. Lawrence Lowlands, is about 46,280 square miles.

B. In the Appalachian Region, the large bodies of water bordering the area moderate the temperatures and provide some of the best fishing grounds in the world.
In the Great Lakes and St. Lawrence Lowlands, the lakes and rivers form one of the greatest transportation systems and are sources for some of the largest hydroelectric power plants in the world.
In the Central Plains Region, lack of water can cause serious damage to crops, and too much water can cause flooding.
In the Cordillera Region, plentiful rain produces dense forests, and the many rivers serve as spawning grounds for salmon.

Page 158: FARMLAND

A. 1. Climate–in many parts of Canada, the weather is too harsh and the growing season too short for growing crops; other parts of Canada receive insufficient rainfall.
Soil–almost half the land in Canada is too rocky and too divided by swamps, lakes, and rivers to be cultivated successfully.

Accessibility–Canada has a small population spread over a large area. Many types of farm produce (particularly mixed and dairy farming) cannot be successfully transported over long distances to markets. Therefore, most farming must be done near large centres of population.

2. The Central Plains Region is farmed extensively.
3. Farming areas along river valleys have several advantages: flat land, fertile soil, protection from severe weather, sources of fresh water for human consumption, and rivers as a means of transportation.
4. The land along the coast is flatter, the climate is milder, and the inhabitants can fish as well as farm.

B. 1. Ontario and Quebec have a climate and soil that is conducive to crop-growing, and they have large markets for their farm products.
2. Newfoundland is not listed; its farm income is not significant enough to show on the chart.
3. Prince Edward Island is very small.
4. a. fruit–Niagara Peninsula, Okanagan Valley, Annapolis Valley.
b. grain–Central Saskatchewan.
c. potatoes–Prince Edward Island.
d. maple syrup–The Eastern Townships of Quebec.
e. dairying–Southwestern Ontario.
f. livestock–Southern Alberta.

Page 159: POPULATION

A. 1. The area of Canada is 3,851,809 square miles (3,560,238 square miles of land and 291,571 square miles of fresh water).
2. The population of Canada is 20,014,880 (according to the 1966 census).
3. Ontario has the largest population (6,960,870); it is the second largest province. It was settled early, it has good transportation facilities (the St. Lawrence–Great Lakes system), a variety of natural resources, a great deal of fertile land for farming, a good climate, and a geographically central position among the provinces.
4. Population centres and farming areas tend to grow up near one another because people need food.
5. A harsh or very dry climate is generally not suitable for farming. A good climate attracts settlers if the area is an agreeable place to live, and if it is possible to grow food or obtain it by other means.
6. British Columbia has the highest rate of growth; Nova Scotia has the lowest.

B. The original inhabitants of Canada were North American Indians and Eskimos.

C. The Germans settled in Ontario and in the Prairie Provinces and were primarily farmers. In cities such as Kitchener, Ontario, they developed the meat packing industry. The Ukranians settled mainly in the West where they became farmers and supplied much of the labor for building the Canadian Pacific Railway. The Italians settled mainly in Ontario and Quebec where they worked in the building and needle trades. The Japanese settled mainly in British Columbia where they were fishermen and farmers.

Page 160: TRAVEL AND TRANSPORT

A. Canada's great size and the long distances separating settlements prevented communication between the different regions until the railway, and later the airplane, could be used extensively.
The rugged terrain of the Shield Region and the lack of lakes and rivers in the Prairie Provinces cut off large areas of Canada from settlement until the development of modern means of transportation.
For safety and convenience, early settlers clustered together in centres that were widely separated. The population was not large enough to fill in the empty land and unite the country.
Much of the country was so far north that it was isolated for most of the year. Only with the development of the airplane has this situation improved.

B. 1. The railway allowed British Columbia to buy from and sell to the eastern provinces, and to develop trade further within the province and with the rest of Canada.
2. a. Between Edmonton and Winnipeg, there is a vast network of railway lines to serve the wheat farmer. From Winnipeg, the wheat goes by railway to Fort William where it is loaded onto freighters for the trip down the Great Lakes and the St. Lawrence River. Grain is also carried by rail to the port of Churchill on Hudson Bay, and to Vancouver and Victoria on the Pacific coast.
b. The Canadian Pacific Railway runs through the Crow's Nest Pass in the southern part of the province. Several railway lines run north from Washington, Idaho, and Montana to the southern parts of the province.
c. Much of Canada's newsprint is exported to the United States. There are good rail connections between these markets and the Canadian centres of Montreal, Toronto, and Quebec City.

d. From the ranches of the Prairie Provinces, the cattle are shipped to Winnipeg and then, via the Lakehead, to the stockyards at Toronto, Montreal, and other eastern centres.
e. Fish from Halifax are shipped via Truro, Moncton, Bathurst, and up the Matapedia Valley to Mont Joli, or, to the United States via Saint John and St. Stephen and on down to Bangor, Maine.

3. Winnipeg, Montreal, Edmonton, Saskatoon, Toronto, Halifax and Vancouver are important railway centres.
4. Railway lines in the Northlands would provide cheaper transportation and thus encourage more settlement, as well as the development of the region's natural resources. The cost of food and other imported goods would be reduced.
5. Wheat is Canada's chief agricultural export.
   a. Wheat is sold to Great Britain, Japan, Germany, and the Soviet Union.
   b. Wheat is shipped from Vancouver, Montreal, Fort William and Port Arthur. (The latter two are now known as Thunder Bay.)
6. The United States buys most of Canada's newsprint.
7. Nickel is exported to Norway, natural gas to the United States, and fish oil to Latin America.

C. 1. Salmon is shipped from Vancouver by railway to the Lakehead, down the Great Lakes, through the St. Lawrence Seaway, and across the Atlantic Ocean to London.
2. In going from Winnipeg to Europe, wheat is shipped through Halifax.

D. 1. a. With a car, the traveller can choose his own route and arrange his own schedule. However, the trip would probably be longer, more tiring, and perhaps more dangerous than by other means of transportation.
   b. The trip would be faster by train than by car. However, the traveller could not choose either his route or schedule.
   c. By plane the trip would be fastest and probably most comfortable. But little of the country can be seen from a plane, and the traveller cannot arrange his own schedule.

2. a. TRIP ALONG THE TRANS-CANADA HIGHWAY FROM HALIFAX TO VANCOUVER

DAY	FROM	VIA	TO	MILES
1	Halifax	Digby Saint John Fredricton	Grand Falls	392
2	Grand Falls	Rivière du Loup Quebec City	Montreal	388
3	Montreal	Ottawa	Peterborough	415
4	Peterborough	Parry Sound	Sudbury	430
5	Sudbury	Sault Ste. Marie	Marathon	442
6	Marathon	Nipigon Thunder Bay	Dryden	404
7	Dryden	Kenora Winnipeg	Virden	392
8	Virden	Moose Jaw	Swift Current	330
9	Swift Current	Medicine Hat Calgary	Banff	400
10	Banff	Kamloops	Lytton	411
11	Lytton		Vancouver	181

Average daily mileage: 399 miles
Total mileage: 4,185 miles
Total time: 10½ days

b. First Day—primarily farmland, gradually becoming hilly, forested and rocky.
Second Day—farmland, backed by wooded hills.
Third Day—farmland changing to an area of hills, lakes and trees, with much of the land becoming rocky.
Fourth Day—vacationland, a country of lakes, rivers, and forests, gradually changing to a rocky and uneven surface with little vegetation.
Fifth Day—the Shield Region, with thick spruce forests and innumerable lakes.
Sixth Day—the Shield Region, with thousands of lakes, thick forests, and much wildlife.
Seventh Day—the land gradually changes to level farmland—huge farms, herds of dairy cattle, and fields of waving grain.
Eighth Day—the same level farmland—the famous wheat belt.
Ninth Day—the foothills of the Rockies; then snow-capped mountain peaks.
Tenth Day—mountainous land with high valleys and plateaus, changing to farm and ranch land.
Eleventh Day—an area of fruit and vegetable farming and flower growing.

c. The fastest travelling would be on the 8th day, between Virden and Swift Current. Except for some gently rolling hills, the land is flat. The slowest travelling would be on the 10th day, between Banff and Lytton. The road goes through Kicking Horse Pass and over the mountains.

3. Open answer.
4. Some of Canada's major problems include: national unity, particularly between the English- and French-speaking territories, the problem of international waters and fishing rights, labor problems, the treatment of the Indians and Eskimos, and priorities for national development. These subjects can can serve as the basis for a class discussion; students may think of other problems.

Page 162: CLIMATE

A. 1. Temperature and rainfall are the main factors influencing climate.
2. a. In the Northlands, the cold climate makes living so difficult that the population remains very small.
b. In the Lowlands, the climate is pleasant; agricultural pursuits and a desirable environment have resulted in a large and growing population in the area.
c. In the Plains, the climate is severe, although more tolerable than that of the Northlands. However, the area is not productive enough to support a large population.

B. 1. Toronto's winters are not severe because it is situated by a large body of water, Lake Ontario, which has a moderating effect on temperatures.
2. Winnipeg is on a flat plain and is so remote from any large bodies of water that moisture-laden winds do not reach it.
3. Winters in Winnipeg are colder than those in Toronto because Winnipeg is farther north, and because Winnipeg is not near any large body of water that might have a moderating effect on its winter temperatures.
4. a. Winter temperatures at Vancouver are much higher than those at Winnipeg because Vancouver is on the seacoast, and the Pacific Ocean keeps the winter temperatures higher than those of Winnipeg.
b. Winter temperatures at Frobisher Bay are much lower than those at Vancouver because Frobisher Bay is much further north than Vancouver.
5. a. The Arctic climatic region has the least precipitation. Very cold air cannot evaporate or carry much moisture, and the frozen land surface does not provide much moisture for evaporation.
b. One can wear the lightest winter clothes in the Oceanic climatic region along the Pacific coast.
c. The Continental climatic region receives an adequate, even amount of precipitation all year.

Page 165: VISUALS

A. 1. Forestry is an important industry in this area.
2. The green colour of the vegetation suggests plentiful rainfall.

B. 1. The photograph offers no indication of where it was taken, except that the city is located in a mountainous area near a major body of water.
2. It is impossible to estimate the population of the city because only part of it is shown; however, the many buildings and houses built closely together indicate a densely populated area.
3. Bridges A and B are 8-10 blocks apart, but it is not possible to give a precise distance without knowing the length of the blocks.
4. The photograph gives no indication of the heights of the mountains.

C. 1. The railway runs along the the peninsula on the shore in the foreground.
2. The sketch suggests the lumber, transportation, and tourist industries.
3. Railways and highways are used to cross the river.
4. A tanker, freighter, tug, passenger ship and sailboat are visible in the sketch.

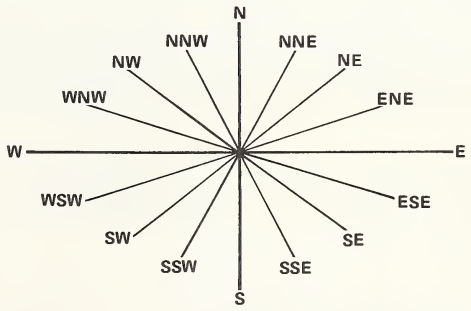
D. 1. The parallel of latitude shown on the map reads 49° 15′ N.
2. The city is Vancouver.
3. The compass point on the map indicates that the top of the map goes toward the north.
4. The body of water is Burrard Inlet.
5. It is 5 miles from the First Narrows to the Second Narrows.
6. A plane must fly at least 6,000 feet to clear the mountains.
7. The map shows that the harbour is well-protected from the sea by Stanley Park, and that there is a large area of water between the First and Second Narrows for mooring and berthing ships.

Page 167: TOOLS OF MAP READING

A. 1. Areas having the same heights are indicated by the same colour.
2. On Map 93, a bridge is indicated by two parallel lines. (See bridges over First Narrows and Second Narrows.)
3. Using the symbols in the legend for Map 93, a number of railways can be found, one coming from the south, and five from the east, all in the area south of Burrard Inlet. Main highways are found all around the outskirts of the city. Pulp and paper mills, mines, and hydroelectric stations are not shown on the map. An airport is shown on the bottom of the map, left of centre.

B. 1. The graph method is used on Map 93.
2. The distance between the two Narrows is just over 5 miles by water.
3. It is 8-9 miles from the main harbour to the University of British Columbia.
4. The two routes are almost equal in length–about 13 miles. The length of the water route depends on the shoals and sandbars that must be avoided; the car route depends on what roads are taken.

C. 1.



2. Point Atkinson (latitude 49° 18′ N., longitude 123° 16′ W.) is northwest of False Creek.
3. Dollarton (latitude 49° 18′ N., longitude 122° 57′ W.) is northeast of Vancouver International Airport.
4. Point Atkinson is west of Prospect Point.
5. The photographer was facing north when the picture was taken.

D. 1. Dark blue: 500-1,000 feet below sea level
Light blue: 0-500 feet below sea level
Dark green: 0-1,000 feet above sea level
Light green: 1,000-2,000 feet above sea level
Beige: 2,000-3,000 feet above sea level
Brown: 3,000-4,000 feet above sea level
Purple: 4,000 feet or more above sea level
2. The Lions are at least 4,000 feet above sea level.

Page 168: TYPES OF MAPS

Relief

1. a. The height of land is indicated by colours.
b. The land is divided into four different levels.
c. Green: 0-600 feet
Blue: 600-1,500 feet
Beige and Yellow: 1,500 feet and over
2. a. The height of Vancouver is 600 feet or less; Penticton and Dawson Creek are both over 1,500 feet.
b. The coast at Prince Rupert is steeper than at Victoria.
c. Most of British Columbia is well above sea level, although there are some low-lying areas.
d. The Fraser River is more than 1,500 feet above sea level at its source, about 1,500 feet above sea level at Prince George, and at sea level at Vancouver.
e. The direction of the flow of the Fraser River is largely determined by the direction of the mountain ranges.

Precipitation

1. a. The blues and greens suggest water and thus abundant rainfall. The yellows and browns suggest dryness, or insufficient rainfall.
b. Precipitation is measured in inches.
c. Purple: under 12 inches
Brown: 12-16 inches
Orange: 16-20 inches
Yellow: 20-30 inches
Light Green: 30-40 inches
Light Blue: 40-60 inches
Dark Green: 60-80 inches
Dark Blue: 80 inches and over
2. a. Victoria's annual precipitation is 20-30 inches; Trail, 12-16 inches; Prince George, 20-30 inches.
b. The greatest amount of precipitation in British Columbia falls along the coast. The southern part of the interior plateau, and the northeastern and northwestern parts of the province get the least precipitation.
c. After crossing the Pacific Ocean, the prevailing westerly winds are laden with moisture. When these winds reach the mountains, they are forced to rise and are cooled. This drop in temperature causes condensation of water particles, and rain falls. Therefore, the rain-bearing air masses do not reach the eastern side of the mountains.

Temperature

1. a. Degrees are used to measure temperature.
b. Each colour represents 10 degrees, except the two extremes of below -10° F. and over 30° F.
2. a. The average January temperatures at Victoria are 30°- 40°F.; at Prince George, 10°- 20°F.; at Trail, 20°- 30°F.; at Prince Rupert, 30°- 40°F.
b. The ocean moderates temperatures along the coast, causing cooler summers and warmer winters.
3. a. Trail's temperatures are lower than Victoria's because Trail is located inland, while Victoria is on the coast, and because the elevation of Trail is much greater than that of Victoria.

b. Generally, the farther north one goes, the colder the temperature becomes because one is moving away from the direct rays of the sun.
c. Three factors causing low temperatures are: latitude—the further north, the colder; altitude—the higher, the colder; distance from large bodies of water—the greater the distance, the colder.
d. The lowest temperatures in British Columbia would be found in the northern part of the province, on high land, and far from the Pacific Ocean.

Water Features

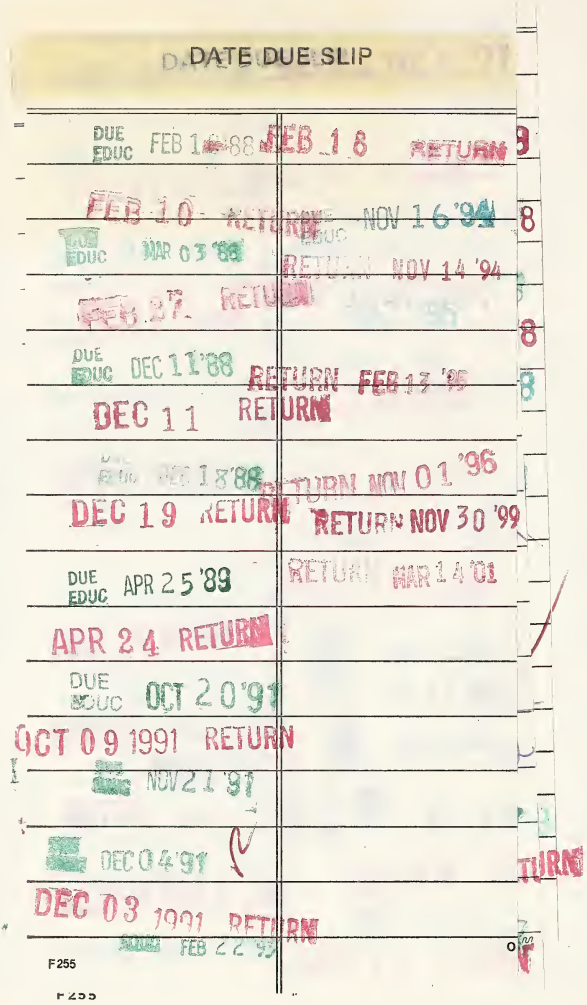
1. Vancouver Island is separated from the mainland by the Queen Charlotte Strait, the Strait of Georgia and the Juan de Fuca Strait.
2. The Fraser River empties into the ocean at Vancouver.
3. Most of the cities in British Columbia are located in the valleys and along the coast in the southern part of the province.
4. The best means of surface transportation from Vancouver to Prince Rupert is ship, because the mountains and deep inlets of this area make it necessary for road and railway routes to go far inland, and then turn westward, resulting in greater distances than need be covered by a ship.
5. The water resources of the area have been used for hydroelectric power, to transport logs from the forest to the mill, for fishing, and for transportation.
6. There are many hydroelectric power sites in this province because the many fast-flowing rivers provide good sources of water. This power is used by the pulp and paper, lumber, fish-processing, and mining industries.

Transportation

1. a. Highways, railways and air transport are shown on the map.
   b. A red plane indicates a major airport.
   c. The symbol for a provincial capital is a black circle around a black dot; the black dot alone is the symbol for other cities.
2. a. There are few major roads in this province because of the difficulties of building roads in the mountainous areas.
   b. Many highways run parallel to rivers because rivers generally create valleys through the mountains, which are often the only economical routes available.
   c. At a speed of 25 miles an hour, it would take 20 hours to go by ship from Vancouver to Prince Rupert. It would take 16 hours to make the same trip by train, travelling at 40 miles an hour.

Population

1. a. The unit used to measure population is people.
   b. Each dot represents 1,000 persons; a circle represents 100 persons.
2. a. The majority of people live in the southern part of the province.
   b. Most settlements are in river valleys; two of the largest settlements are Vancouver and Victoria.
   c. Much of this province is uninhabited because of its high mountains and inaccessible valleys.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GUINNESS